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&c. &c. &c.

A

PRACTICAL TREATISE

ON

DYING

WOOLLEN, COTTON, AND SILK,

INCLUDING RECIPES FOR

LAC REDS AND SCARLETS—CHROME YELLOWS AND
ORANGES—AND PRUSSIAN BLUES—ON SILKS,
COTTONS AND WOOLLENS.

WITH EVERY IMPROVEMENT IN THE ART, MADE SINCE THE YEAR [illegible].

ALSO,

A CORRECT DESCRIPTION OF

SULPHURING WOOLLENS.

OF THE
UNIVERSITY
OF

BY WILLIAM PARTRIDGE.

NEW-YORK:
PUBLISHED BY THE AUTHOR,
DYE-STUFF DEALER,
34 CLIFF-STREET.
1834.

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Entered, according to the Act of Congress, in the year 1834, by WILLIAM PARTRIDGE, in the Clerk's Office of the District Court of the Southern District of New-York.

The Author informs Manufacturers and Dyers, that he is at all times willing and desirous to give any information and recipes, that may be in his power, respecting the manufacture of woollens and dying, *free of cost.*

STEREOTYPED BY HENRY W. REES,
45 GOLD STREET, NEW-YORK.

A. 4. 4.

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APPENDIX.

On Prussian blue Dying.

In my last edition I gave an account of a discovery made by Messrs. Wm. Adams & Co., of New York, of an improved process of dying black and Prussian blue on calico. I was informed, very recently, by a large dyer of Frankfort, Pennsylvania, that he had adopted the improvement, and had realized by it many hundreds of dollars. Such information is truly encouraging, and I hope many others have experienced results equally beneficial. The discovery consists in oxydizing the iron before applying the coloring matter. I am of the opinion that dying and color-making are altogether the result of oxydizement and de-oxydizement.

It has several times gone the rounds of our newspapers, since I published my last edition, that a new blue for woolens had been discovered superior to indigo in brilliancy and permanency. I would wish to put our manufacturers on their guard relative to this barefaced quackery. It has been long known that a Prussian blue can be made on woolen of a superior brilliancy to indigo; but it has been as well known that this color will not stand the action of an alkali. Even the soap used in fulling the cloth will change the color. In the advertisement of the inventor, he asserts "that he has discovered a means of preventing this change." On seeing this I sent to his agent, Mr. Marshall, for a pattern of his color, and I never tested any Prussian blue on woolen that gave way more readily on the application of an alkali. I can assure our dyers that the property of an alkali to take prussic acid from iron, leaving the color a dirty green drab, is a law implanted on nature by supreme intelligence, and that man never can prevent its action. This color has been applied to a great variety of goods,

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and its application may be much extended. It would answer for carpet yarn, or any other fabric requiring no alkali in its subsequent manipulations.

On the New Fulling Mill.

I sent to England to obtain a drawing and description of their new Fulling Mill, offering twenty-five pounds for it, but in this attempt I failed. I mentioned this patent in my last edition, and have obtained very little additional information. It is said to work with two pair of rollers, one of the rollers being a metallic cylinder into which steam is conveyed. The advantage is said to be fully equal to ten per cent. on the value of the goods, and is, therefore, of too much consequence to our woolen factories to be neglected.

I was informed by a small sattinet manufacturer, from the state of New Hampshire, that he fulled his cloths with a pair of fluted rollers, and that the work was better done than by any old process. This must have been six or seven years since, as he quit the business more than five years ago. It is surprising that other manufacturers have neglected to follow an improvement so obviously beneficial.

On Oil for Wool.

The heavy duty on oil should long since have induced our manufacturers to find a home supply. It is an important item in woolen manufacturing, and can, no doubt, be obtained cheaper at home than from foreign countries. When I was in Kentucky, finding oil very dear, I planted the sunflower seed, had the seeds collected at maturity, the oil expressed at a common oil-mill, and found it when used on wool to be fully equal to the best olive. I ascertained that about forty gallons could be expressed from the seed raised on one acre, and that the cake was equal to corn for fatting hogs or poultry.

The bene plant is very abundant in Florida, the negroes using the seed in their soup. The seeds of this plant afford about three gallons of oil to the bushel, and the cold expression is fully equal to the best table oil. The raising of this seed was prohibited in France many years since, for fear of its ruining the olive growers. I have no doubt an ample supply of this seed could be obtained from Florida if proper arrangements were made. I obtained my information from Col. John Lee Williams, St. Augustine, Florida. This gentleman published a work on Florida about two years since, and would, no doubt, give such information as would be required by any respectable manufacturer.

They have lately introduced in England, two other vegetable oils for using on wool, the cocoanut oil, and the teal seed oil. The oil from the cocoanut is used only during the summer months, it being too hard for use in cold weather. The teal seed oil is imported from the East Indies, and all I know about it is, that it has lately been much used in oiling of wool by English woolen manufacturers, and that a small quantity has recently arrived in New York.

About three years since I heard of a process by which an equal quantity of oil and water could be mixed, so as to make a saving of about forty per cent. on the quantity of oil used on the wool. Having been informed that such was used by the Pontoosuc Woolen Factory, Pittsfield, Mass., I wrote to Mr. Clapp, part owner and agent of that factory, to make inquiry relative to the fact, and to solicit information as to the process. I soon received the particulars from that gentleman, with a request to make any use I pleased of it. It is very simple, as is every art when understood. Take one gallon of oil, and one gallon of water, and mix the two by adding as much liquid ammonia as will cause the oil to combine with the water—it requires from four to six ounces of single F. This process will answer with any kind of oil, and should be used by every woolen manufacturer.

Fraud on the Tare of Imported Goods.

There is an evil rapidly growing in this country that must seriously affect the interest of our manufacturers and citizens of all classes. I refer to the frauds on the tare of imported articles. Some ten years since an occasional loss would be sustained of one or two pounds on ceroons of indigo; so much has this fraud increased, that a loss of two pounds on each package is nothing thought of, it frequently extending to six or ten pounds on a ceroon. In one purchase of $16,000 a loss was sustained of nearly $1,000. Foreigners finding they can cheat us in one article, have lately been extending their frauds to others, and I doubt not that our country is now losing from two to three millions of dollars per annum by fraudulent packages, and this loss must ultimately fall on the consumer. If this operation be not checked we shall soon be losers to double and treble the present amount. There is one effectual cure for the evil—that the actual tare be taken at the customhouse, and this tare to be allowed on sales. Our citizens have to determine if this shall be the only country in which open and direct fraud shall be sanctioned by the community.

To dye Turkey Red on 200lbs. of Cotton Yarn.

Boil the yarn six hours in a lye of pearlash of 1° Baumé. It is still better to make a soda lye. Wash well, wring out and dry.

Prepare a tub of cold water, holding sufficient to soak the 200lbs. of yarn—put in it 25lbs. of sheep's dung, strained through a copper sieve, add soda until the liquor stands at 2° Baumé—then add 8lbs. of olive oil; mix well, and work the cotton in this by 2lbs. at a time, adding as much of the liquor in another tub as will be sufficient to moisten each lot thoroughly.

The above operation has to be repeated six times, making a fresh liquor for each without sheep's dung. Each time prepare a fresh tub with soda 1¼° Baumé and 8lbs. of olive oil. Between each dipping wring smoothly, hang in the air, and then dry in a warm room.

8th, Make another liquor of soda of 2° Baumé, run the yarn through this, wring and dry as before.

Make another tub with lukewarm water, put the cotton in, and let lie three hours—take it out, wash well, dry it in the air and then in a warm room.

Take 15lbs. of blue, and 7lbs. of white galls, ground, pass the cotton through this as hot as the hand will bear—wring out, dry well, first in the air, and then in a hot room.

Boil 20lbs. of sumach one hour, strain and run the yarn through this as hot as the hand can bear—dry as before.

Make mordant with 16lbs. of alum and a little pearlash—pass the cotton through this at a moderate heat; dry as before.

Make another liquor with 26lbs. of alum—run through, and wash it thoroughly—no drying required.

To Dye the Red.

Use 1¼lb. of the best madder to each pound of cotton. Let half the madder be of the best Avignon or French, and the other half of the best Dutch.

Dye the 200lbs. in three kettles. In each kettle use 4lbs. of pounded galls, and 4 pails of bullocks' blood—add the madder, 83⅓lbs., to each kettle. Put the cotton in on sticks, put fires under the kettles, handle the yarn well, and bring to a boil in 1½ hour. Take off the cotton from the sticks, run strings through it, let sink in the kettles, placing grating over each, with weights enough on the gratings to prevent the cotton from rising. Boil the cotton during 20 minutes, take it out and wash well.

A kettle must be prepared with a dome cover, having a small pipe through the centre at top. The top must be screwed down with four screws—the whole must be very strong to prevent the steam from blowing it off. Use soft water, and add to it 19lbs. soda—soon as the liquor boils, put in the cotton, screw down the top, and boil it 12 hours. Take it out the following morning and wash it well.

Dissolve 2lbs. of salts of tin in a tub of water, run the cotton through, and wring out.

Take the liquor out of dome-kettle, clean it well, put in soft water, add 13lbs. of Marseilles soap, and ¾lb. salts of tin. Boil the soap until dissolved before adding the tin First dissolve the tin in water—put in the cotton and move it well—stir the liquor well before putting in the cotton.

Wash perfectly clean and dry well. It is now finished.

N. B. If more madder is used, use more of the other materials—if less madder, a smaller portion.

To Dye Madder Browns dark and rich, on 200lbs. of Cotton Yarn.

Prepare the same as for red—give 7 dips in the oil and soda, and two dips in a soda lye of 2° Baumé—the more soda, the bluer will be the color.

Mordants used to prepare for dying—18lbs. of nut-galls, 20lbs. of alum, 12lbs. of copperas, 3lbs. of blue vitriol, and 1lb. of verdigris—dissolve these in a kettle of water, and strain through a cloth without disturbing the bottom. Work the cotton through this in two pounds each lot twice—well wash.

Use for dyeing 260lbs. of madder—use the same process as for red, leaving out the galls and bullocks' blood—after dyeing boil in the dome-kettle, with 32lbs. of soda, for 1½ hour. Take out, wash thoroughly, and dry.

A great variety of shades may be produced by using less madder, and more or less of copperas and blue vitriol.

To dye 92lbs. of Saxony Wool a dark Brown of an Adelaide shade.

First dye the wool blue in the woad vat as deep as for a dark green, wash clean, and finish with the following dye-stuffs:

8lbs. chipped fustic, 95lbs. hyper-nic; boil in bags two hours.

Boil the wool two hours. Sadden with 1½lb. ground logwood, 1½lb. copperas.

Boil the wool one hour, let it lie in the liquor eight hours, land and wash.

For a deep Bronze Green.

To dye 107lbs. of clean wool—give a light shade of blue in the woad vat, and wash well. Boil in kettle.

70lbs. fustic for three hours, then add 9lbs. redwood, 10lbs. mull madder, and 5lbs. of ground logwood. Boil wares two hours, and wool two hours, then sadden with 4lbs. alum, and ¾lb. of copperas, boil wool one hour, and add to the liquor 7lbs. ground fustic, 3lbs. mull madder, 1½lbs. alum. Just bring the liquor to a boil, draw the fire, and let lie eight hours—land and wash.

For a beautiful Adelaide on 100lbs. Saxony wool. To be dyed a light shade of blue in the woad vat, and well washed. Boil in kettle 70lbs. of hyper-nic and 2lbs. of argol for 1½ hour—boil the wool 1½ hour—then add 4lbs. of ground logwood, and 1lb. of copperas, boil wool 1 hour, lie in 1 hour, pump up, run off, and wash well.

To dye 105lbs. Saxony wool a dark olive green. To be dyed a light shade of blue in the woad vat, and well washed. Boil in kettle 110lbs. of chipped fustic for 2½ hours, then add thirty pounds of mull madder, and eight pounds of barwood—boil half hour, put in the wool and boil it 2½ hours—then add 5lbs. of alum, and 5lbs. of mull madder, boil one hour, let the wool lie in all night, land and wash well.

To dye 114*lbs. Saxony Wool a beautiful and permanent Brown.*

Boil 85lbs. fustick in bags for 2 hours; take out the bags and add to the liquor 24lbs. barwood, 12lbs. mull madder, and 1lb. of logwood, boil liquor one hour, run up, heave the wool in, handle well and boil two hours—cool down and strew over 3lbs. alum, 2lbs. logwood, and 1¼lb. copperas, boil one hour, lie in liquor seven hours, land, wash well, and then blue in the woad vat until of the required shade. A great variety of shades may be made, by giving more or less of the blue, as well as by adding or diminishing the proportions of dye-stuffs.

To dye 100lbs. Saxony Wool a light Invisible Green.

First prepare the wool by boiling it in a clear liquor of alum, using 26lbs. for one hour, land and wash.

Prepare a kettle with clean water, add 80lbs. of weld, 10lbs. of fustick, and 5lbs. of logwood—boil the wares 2 hours, and the wool two, cool down and sadden with 2lbs. ground logwood, and one of copperas, boil wool one hour, let lie cooling 7 hours, wash well, and dye in blue vat to the color wanted.

Note—That as weld is very little in use here, half the quantity of quercitron bark may be used, or two thirds as much of fustic.

A great variety of shades of invisible green may be made by increasing the proportion of logwood in the preparation, and by adding lighter or darker shades of blue

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To dye 127lbs. Saxony Wool a deep Tea Brown, inclining to Olive.

Boil in bags 80lbs. fustick, and 13lbs. of logwood for 3 hours, take out the bags, and add to the liquor 6lbs. of barwood, and 3lbs. of ground logwood—boil the wool in this for two hours, then sadden with 2lbs. of alum, and 2¾lbs. of copperas, and 3lbs. of logwood, boil 1 hour, let lie in 9 hours, land, wash well, and then dye in blue vat to the required shade.

To dye 80lbs. of Saxony Wool a light and beautiful Brown.

Boil in bags 70lbs. of fustick for 2½ hours, then add to the liquor 13lbs. barwood, 7lbs. mull madder, and 3lbs. of ground logwood, heave in the wool and boil 2 hours, cool down and sadden with 4lbs. alum and 1lb. of copperas, boil 1½ hour, lie in 7 hours, land, wash, and dye in blue vat to pattern—a vat very weak of indigo must be used for light colors.

INTRODUCTION.

DYING is in every branch a chymical art, and the play of affinities are so numerous, and in most instances so rapid, as entirely to escape the notice of common workmen. Men of science have paid but little attention to this art, nor can it be expected they will pay much till other more interesting subjects are perfected, as it will require much time, and numberless tedious and expensive experiments. The improvements that have been made during the last twenty years, and they have been numerous, have been developed by practical men, possessing more or less scientific knowledge.

I would strongly urge every practical dyer, who may be desirous of attaining eminence in the art, as also for the purpose of making money by economizing in his processes, to make chymical science his particular study, and to embrace every opportunity of attending lectures, until he becomes sufficiently acquainted with the science to understand what is going on in his own business. A dyer, totally ignorant of chymistry, can form no conception of any process he pursues; he follows his business mechanically, making no colours but such as he has been taught to make, and should he stumble on any thing new, it must be merely the effect of chance, often costing more than its worth. A dyer, on the contrary, who has made himself commonly proficient in chymistry, will often make discoveries highly beneficial to himself, and when made known, conferring wealth on the general community. Another consideration, of high import, is the relative change that takes place in the situation of the dyer himself. From being a mere mechanical drudge, ignorant of every process that passes before him, he becomes the intelligent operator, charmed with his pursuit, and standing high in the estimation of his most intelligent fellow-citizens.

The government of this country has lately changed its views, and the protective system, under which we had prospered so highly, has been destroyed. This will make it more than ever necessary, that our dyers and manufacturers should economize in their various pursuits, and become as perfect in their manipulations as they are in other countries, for without this they must resign all hope of competing with their foreign opponents.

This change in the protective policy of the country may probably produce other effects that will make it desirable our farmers should understand dying, as well as the manufacturers. It is pretty certain that in less than ten years nearly all our small, and very many of our large woollen manufacturers, will be broken down by foreign competition. After this has been effected, all kinds of goods will rise in value, and as the present consumers of agricultural products will have become producers, the farmers must return to domestic manufactures to enable them to support their families. With a view to this change, I have reduced the scale of my recipes so as to come within the consumption of families. It will be perceived that each recipe for woollens is given for sixteen pounds of cloth, having ascertained that family-made woollens are usually twenty yards, weighing sixteen pounds. I have frequently been solicited to make this reduction, by country clothiers.

Since my last work was published, a number of new materials have been employed in dying, several of them of great importance to the practical dyer. Such as the colouring matter of the coccus lacca, or lac dye; those obtained from chromates, and the prussian blue colours—all of which will be particularized when recipes are given.

A scarlet is produced from the lac dye fully equal to that from cochineal, and at less than half the expense. Even the dull red from madder is more expensive. Lac dye cannot be used for all colours as a substitute for cochineal, because it will not turn blue by the application of alkalis, therefore it is useless in pinks, and does not succeed well in crimson; but this very property enhances its value as a scarlet dye, for lac wili not pink by perspiration, whereas cochineal will lose its brilliancy by one day's wear in warm weather. This colouring matter has not yet been applied to cotton goods, and by only one dyer, to my knowledge, on silk.

Brilliant and beautiful yellows and oranges are now obtained from chromates of potash, and any salts containing lead. This colour is applied exclusively to cotton goods. Silk can be coloured with it, but the texture appears to be so seriously injured as to leave it with much the appearance of cotton. The cotton is first dipped in a solution of acetite or nitrate of lead, and then in a solution of bichromate of potash, when a most brilliant and tolerably permanent yellow is produced. By the use of lime-water a good orange can be obtained.

Prussian blues have been made on silk and cotton some ten or twelve years, and its application is increasing. On woollen goods this colour has not been much used. The great difficulty in dying prussian blue on woollens, arose from the very unequal manner the colouring matter was received on such fabrics. This difficulty has been obviated by what is termed the clearing process, as will be seen in the recipes given for such colours. I shall give some instructions relative to a new mode of producing prussian blues on all descriptions of goods, originating with myself, which has been tried by a practical workman and found eminently successful.

I would call the attention of our dyers to one particular in the application of mordants in the process of colouring.

It has been ascertained, by actual experiment, that white goods impregnated with mordants, uncombined with colouring matter, will give out again all their mordants unchanged if washed much in water, a fact which every dyer should be aware of, as many of them are taught to wash their goods after being saturated with mordants. There can be but few dyers so ignorant as not to know that when more than the loose mordants are washed off, the colour will be weak and imperfect. It has also been proved that when a small portion of colouring matter is combined in the goods with the mordants, the latter cannot be washed out with water. It is evident, therefore, that in all cases where the colour will allow of it, a portion of the colouring matter should be used with the mordants; and where this is not allowable, a very slight washing should be given to the goods, and none if the colour can be obtained as well without it.

Our dyers have, within a few years, made great progress in the art. This improvement may have been, in many instances, the result of information given in my work, and from recipes subsequently given on personal application, as well as by letter; but I attribute it more to the arrival in this country of numerous first-rate dyers and colourmen from all parts of Europe, and to the judgment acquired by a more extensive practice. There is still abundant room for further improvement, and I would suggest that a more liberal communication of new facts be made known as they arise. I do not mean that a dyer, who makes his living by the art, should communicate his secret processes; but there are many facts continually developed during the manipulations of every dyer, which could do him no injury if made known, that might in the hands of more scientific workmen lead to results highly important to the art.

I am well aware that very many men are so selfish as never to give information to others, nor ever give credit to those from whom they receive valuable information; but the exclusive selfishness of the few ought never to check the spread of intelligence by the more liberal part of the community. It is with much pleasure I acknowledged numerous obligations of this kind, and I will mention one from which valuable results may ensue. Sometime last summer, the Messrs. William Adams & Co., of this city, presented me with samples of black calico coloured in two hours from the white ground. As black on cotton had never, to my knowledge, been done in less than three or four days, and usually occupying a week; and as the colours were better than the general run, I requested an account of their process, which they very readily communicated. It was effected by merely running the goods through a weak solution of chloride of lime, after they were impregnated with the iron liquor. It was evident that this beneficial effect was brought about solely by a more than usually rapid oxydizement of the iron previously given to the calico. The superiority of the colours by this new process, proves that the oxydizement of the iron is more complete than when produced by atmospheric exposure. It immediately occurred to me, that the application might be usefully extended to all processes in dying in which a high state of metallic oxyde was required. Prussian blue colours depending altogether on the state of the oxyde iron given to the goods previously to dipping them into a solution of prussiate of potash, I inferred that a chloride solution would much improve the present process. In a few days after I had come to this conclusion, I persuaded a dyer in the city to try it, he having complained of the difficulty he met with in giving sufficient body to his colours. In a few days he returned highly elated with his success, and informed me that it had acted like a charm; that his colours were full-bodied at one dip, that the iron did not leave the goods as before, and that the tints were unusually rich.

In dying of woollen goods it is of the first importance they should be made perfectly clean before any mordant or colouring matter be put on them. Our dyers are too generally negligent in this branch of their operations. They are too apt to consider that goods from the fulling-mill are clean after being washed from the soap, without being aware that water can never wash all the soap from woollen, and that what remains in the goods, will, when decomposed by any of the salts or acids, lose the alkali of the soap, and liberate the oleaginous matter as free grease. In this state no goods will ever receive a bright and permanent colour.

Fullers-earth should be used altogether as the ultimate cleansing material. No other substance, at present known, will answer as well, for when well washed out, it leaves nothing remaining that can injure the most delicate tints of colours.

All dark-coloured goods, particularly blue and black, should also be cleansed with fullers-earth. Blacks when cleansed with soap will have a brown tinge, and lose all their brilliancy, assuming the appearance of half-worn colours. Blues when finished with soap are left with a mealy ground, that seriously injures the appearance of the goods, and lessens their value in the market.

I shall give a particular description of this process under the head of cleansing of woollens, and I would strongly urge every dyer to give the process a fair trial with genuine fullers-earth, and ascertain by actual experiment the decided advantages resulting from it.

I would call the attention of our dyers to the necessity of using given weights and measures in all their processes. Every practical dyer, of much experience, must be aware that he never can employ the recipes of others with any certainty of successful results, unless he shall have received them from a person who practised them in the same dye-house, and with the same water. Any dyer who is attentive to his business, may acquire celebrity in a few months by weighing his materials, writing down the recipes, and adding to each recipe a pattern of the colour produced. And this is the only means by which a dyer can become proficient in his art, for colours are continually varying; that which is fashionable one year going out and another succeeding it. I have known colours fashionable for a season, the next season entirely out, being totally neglected for thirty years, and then again become fashionable. If books of recipes with patterns attached to them were kept by our dyers for each colour, and every material variation in the shade of each, they could never be at a loss to colour and match every new colour. This is the common practice of every dyer in England that has attained a name, and those who pursue the plan go on with much more ease to themselves, much greater certainty in obtaining correct results, and with more economy in producing their colours.

PREPARATORY PROCESSES.

Scouring of Wool.

THIS is an important operation, much more so than is generally imagined by those who are not well versed in the art of dying and manufacturing; for unless the wool be well scoured, and thoroughly cleansed from the yolk and grease, the subsequent operations will be materially injured, as good colours, or good cloth, never can be made from wool badly scoured.

For scouring, a shallow conical furnace is employed, holding from one to two hundred gallons, according with the extent of the factory, which may be made either of copper or iron. It is set in brick-work as other furnaces are; but the fire is never permitted to reach more than one-third of its height. If the furnace is three feet deep, the fire being under the bottom, it should be closed by brick-work at one foot above the fire.

The apparatus used for washing of wool, after it is taken from the furnace, is uniformly of an oblong square; but they are constructed of different materials, and vary in the mode of applying the water. Some are merely willow-baskets; others are made of board on the bottom and sides for about half their height, the upper part being constructed of strong open wire-work, with a wooden curb around the top. Some few are made entirely of sheet copper, with holes perforated about halfway from the top downwards: these are always placed in running streams where the water is not too rapid, such as mill-ponds, or tail-races. The current should be strong enough to keep the water inside the washer continually changing, yet not so strong as to drive the wool too hard against the side opposite to where it enters, which will be attended with considerable delay and trouble, as well as with a loss of wool, for many of the finer locks will be washed through the wires, or over the top of the curb.

An apparatus superior to either of the above is now generally used for washing of wool, where a head of water from five feet upwards, can be obtained. The shape of this is also an oblong square, and for a full-sized washer is five feet long, two feet three inches wide, and the same in depth: a stout false bottom is added about three inches above the real one—in it are drilled an indefinite number of small holes, about three-eighths of an inch in diameter, and the water is conveyed in between the two bottoms by means of a two or three inch pipe, into which a cock is placed to stop the supply when necessary. A number of small holes are drilled in the ends and sides of the washer, twelve inches from the top, to let the foul water run off. When the water is turned on, it will be forced up through the drilled holes with a power equal to the weight of the column, which is sufficient with a fall of five or six feet to keep the surface in a state of constant ebullition. When scoured wool is thrown into one of these machines, it is kept floating and in rapid motion on the surface, by the upward pressure of the column, and the foul water passes off through the holes on the top. The workman stands on one side of the washer and moves the wool backwards and forwards with a jerking motion, by means of an iron prong, until the water passes through it perfectly limpid—when he throws out that quantity and replaces it by another.

In constructing this machine, it is necessary to be guarded in two particular circumstances; first, that the united capacity of the holes drilled in the false bottom, be not quite equal to deliver all the water supplied by the column: for when this happens, the supply will operate partially, and the designed effect be in a great measure destroyed. In the next place it is necessary that the holes drilled around the vessel, to let off the foul water, shall be sufficient to let off all that the column may supply, when the wool is in the basket, without permitting the water to rise to the top; unless this is attended to, the water will flow over the washer and take the wool with it.

To make the Scouring Liquor.

Animal urine is the material mostly used for scouring of wool. The volatile alkali, that part of the urine which combines with the grease and yolk, does not injure wool, unless it be in considerable excess, or too much heat be applied; whereas the fixed alkalis operate so powerfully as to dissolve a portion of the wool at a temperature that will scour it.

Urine that is fresh voided will not scour well. That from persons living on plain diet, is stronger and better than from luxurious livers. The cider and gin drinkers are considered to produce the worst, and the beer drinker the best. When urine is collected, it should be kept in close vessels until it has completely undergone those changes by which its ammonia is developed.

To make a new liquor for scouring fine wool, use one bucket of urine to two of water. Some wool requires more and some less of urine; if too much is used, the wool will be stringy and difficult to work; if too small a quantity, the yolk and grease will not be cleansed out of it. The same portions of urine and water as are used in making a new liquor, should be employed in filling up during the progress of the work. The urine should be old, and the water the softest that can be procured. It occasionally happens that a liquor, when fresh made, will not scour well; whenever this occurs, mix one or two quarts of soap in hot water, and add it to the liquor; but this should never be done if the menstruum will scour well without it.

When a liquor is prepared, a frame with cross-bars must be placed over the furnace, resting on the curb; this is intended to receive the wool when taken out of the furnace. As much wool is immersed in the furnace at once as will work easy therein; when entered, it requires to be worked backwarks and forwards for five minutes, and to remain in from about fifteen to twenty-five, or till the yolk and grease have combined with the ammonia. To know when the solution is complete, take a handful from the furnace, squeeze the liquor out of it, and wash it in water. This sample will show if it be clean. When clean, take it from the liquor and throw it on the cross-bars over the furnace, leaving it ten minutes to drain; then throw in another quantity, and work as before. Wash that which has drained, as before directed, till perfectly clean.

The scouring liquor should not be too cold nor too hot; the proper temperature is from one hundred and twenty to one hundred and thirty degrees, Fahrenheit, and it should never be lower than one hundred and twenty. If the wool be immersed in too hot a liquor, it will be slammed, as the workmen call it—that is, it will become matted and stringy, and the yolk will become so permanently fixed in it, as to be immoveable by any subsequent process. When, therefore, a new liquor is to be made, and also every morning before the work begins, let the workmen take a handful of unscoured wool and dip it five or six times in the liquor, and then wash it to try if it be clean: if the sample does not scour well, the heat must either be raised or lowered, and if this does not produce the desired effect, the error must be either in the weakness or strength of the liquor, and more urine, or more water must be added, according to the experience of the workman.

When wool has been scoured, that part which has to be coloured, is sent to the dye-house, and that which is intended to be dried for white work or mixtures, is spread out on sheets, or platforms, and exposed to the sun and air to dry. In bad weather wool must be dried in stoves.

A New Scouring Liquor.

Another mode of scouring wool has been invented in this country since I published my former work; the process is as follows: take one quart of olive oil, and half a pint of oil of vitriol, mix well by stirring, and let the mixture stand for twenty-four hours. To fifty quarts of water, use five pounds of potash. The water should be boiling, and the potash well dissolved. Reduce the temperature to about one hundred degrees, and mix with it half a pint of the composition. With this, and in the above proportions, the scouring liquor is made. The workmanship in this, is the same as before described.

An entire new process for Scouring of Wool.

I have received, since this work has been in press, a new material for scouring of wool, called the patent extract of quilliag. I have tried some very foul wool, with a solution of the extract at the temperature of new milk, and in a few minutes it was washed, proving perfectly clean, and when dry retained a peculiar soft and silky feeling. I do not hesitate to say that it is by far the best material that has ever been used for the purpose.

It is used with singular advantages in cleansing of coloured cloth, as it will make blues and blacks perfectly clean, and give them a great lustre. It is also used in the finishing of woollen cloth by merely sponging the face. A Yorkshire manufacturer, in his letter to the agent, accompanying an order for the extract, gives the following account of it:—"I have tried it in the finishing of broadcloths, and have been really astonished at the effect; a cloth at fourteen shillings a yard, finished with the extract, has the lustre and feeling of one at twenty shillings, finished in the old way. This consists in the beautiful lustre and soft feeling it gives the cloth, without the old method of pressing with heat."

Perhaps nothing will demonstrate its powerful effects more, on a more simple experiment, than to take the half-worn coat, wash it in the quilliag and dry it in the sun, and it will have the lustre as fine as the day it came out of the tailor's hands. In such a country as the United States, it is an article of the first importance, as it will be a decided help to the growing manufactures, and do more than any thing else to assist her to struggle against foreign manufacturers who take advantage of every assistance the arts or sciences can afford, to bring their goods cheap to market.

The general proportions to use the extract, is one pound of the extract to eighty gallons of water; but in regulating this, the manufacturer will be the best judge, as some kinds of cloths may require a stronger solution than others.

To make Tin Liquors, for Scarlet and other colours.

These preparations are always made in glass or stone ware vessels. In woollen dying, the acids are never saturated with tin, and the pots are usually placed in cold water, when nitromuriates are prepared. When tin liquors highly saturated with tin are wanting, the operation is performed in a sand heat.

To prepare Nitro-muriate of Tin, for woollen dying.

Into each pot put four pints of single aquafortis, or two and a half of duplex; add two pints of water to the single, and three or four to the duplex: put into each pot a handful of white blown salt, and each requires about eight ounces of granulated tin. The tin is supplied gradually, a small handful at a time into each pot, which must be kept stirred until it is nearly dissolved, when add another handful till the whole is in solution. The stirring should be performed with a rod of white basket-willow, or glass. Some dyers use sal-ammoniac in place of salt; but any salt whose base is muriatic acid, and whose component part will not injure the solution, will answer for this purpose; for the only use of a muriate is to enable the aquafortis to hold the tin in solution.

To prepare Muriate of Tin.

Muriatic acid, or what is commonly called spirit of salt, is often prepared separately, and the solution added in given proportions, to the nitro-muriate before using it. Sometimes, and in many colours of late, the muriate of tin is used without any admixture; this is particularly the case with the lac dye on woollens, and in many colours on cottons. Muriates are sometimes prepared with a small quantity of tin, and are sometimes highly saturated; the former mostly used for woollen dying, the latter for cotton. The weaker solutions may be prepared cold, by merely putting into the acid as much tin as the particular preparation requires, and leaving it until dissolved. This will answer for muriates, when the specific gravity of the acid is 21° or 22° Baume, and not more than two ounces of tin to each pound of acid is required in solution; but when a greater portion of tin is required to be taken up by the acid, a sand heat must be employed; by which means an acid, of the gravity abovementioned, may be made to take up its weight of tin.

To prepare Sulpho-muriate of Tin.

Take in the proportion of two pounds of muriatic acid to one of oil of vitriol. Add to two pounds of muriatic acid, four or five ounces of tin, let it dissolve, and then gradually add one pound of oil of vitriol. In two or three days the solution will be fit for use.

To make Nitro-muriate of Tin.

Take five measures of muriate of tin at 120° Tweedle; add to it one measure of nitrous acid at 90° Tweedle. A great action, or effervescence, takes place as soon as the nitrous acid is added to the muriate, which makes it necessary to have larger vessels, in proportion to the quantity prepared, than for common solutions.

To test Tin, for Copper or Lead.

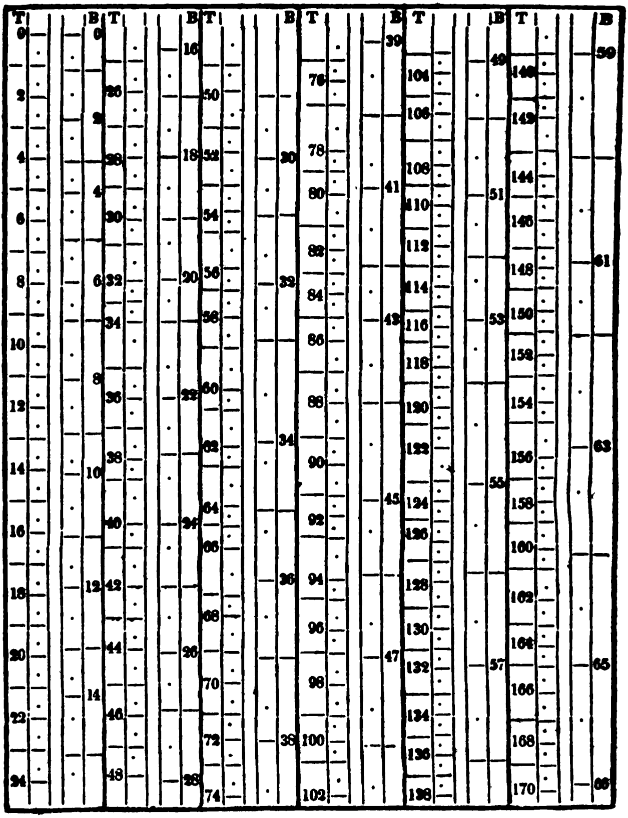
Tin of commerce frequently contains either a minute portion of copper or lead, and sometimes both these metals are present. In all delicate colours, the presence of either of these metals, however minute the quantity, must be injurious, therefore the dyer should understand how to detect them. "To ascertain the purity of tin by means of nitric acid, put one part of the filings of the suspected metal into a basin, and add to it three parts of nitric acid: a violent action ensues, the acid is rapidly decomposed, copious red fumes are disengaged, and the temperature rises. The tin becomes so highly oxydized that it does not pass into a state of solution, but forms a white powder, in which, after having been washed, there are no traces of nitric acid, and is, therefore, nearly a pure oxyde.

When this has been effected, pour a quantity of distilled water on the mass, stir together, and let stand undisturbed, or filter, till the supernatant fluid becomes clear. Decant the clear fluid, and add to it liquid ammonia in excess: if the tin contained copper, the fluid will assume a blue colour. To assay it for lead, add to another portion of the clear fluid a few grains of sulphate of soda, dissolved in water, which will occasion a white precipitate, if lead be present."

On ascertaining Specific Gravities.

It is almost necessary, to ensure correct results, that our calico printers and dyers should know the specific gravity of the acids they purchase, the tin liquors they use, their solutions of salts, and of the menstruums used either for dying or topical application. Master workmen from England and Scotland are in the habit of using Tweedle's hydrometers, which in this country are not easily procured, and when found are very costly. The French hydrometers of Baume, are imported largely, and sold cheap. As Dr. Ures's comparative scale will enable our artists to use Baume, I have added that scale for their government.

Dr. Ures's Comparative Scale between Tweedle and Baume.



In the above scale, the line headed T gives the scale of Tweedle's hydrometer; and the opposite line, marked B, that of Baume's. The numbers, lines, and dots, marked in each column, indicate the relative scale of the two; and any person using Baume's, in place of Tweedle's, can ascertain the specific gravity of any liquid as well on the former as the latter, particularly so with Tweedle's number one, 15½° Baume being 24° Tweedle. As Tweedle's scale increases, the difference between the two increases, but any given specific gravity can be ascertained exactly as well on Baume's as on Tweedle's, by an accurate attention to the above comparative scale.

To mix Oil of Vitriol and Indigo.

This mixture is known by chymists as sulphate of indigo. In England it is called Saxon blue, and in this country chymic, by the workmen.

It is necessary to the producing of a good solution, that the oil of vitriol should be of the specific gravity of 66° Baume, or 170° Tweedle, and that it should be free from all foreign matter. American oil of vitriol has generally the proper specific gravity, but none I have yet tried acts well in making chymic. On making inquiry into the cause, I find that in England the makers use five per cent. of saltpetre, in this country from ten to twelve per cent., and as the process is the same, with the above exception, I am inclined to infer that a portion of the nitrous fumes becomes condensed, and mixes with the oil of vitriol in the state of nitric acid. I cannot be mistaken in asserting that American oil of vitriol is unfit for making good chymic, as will be proved by the following facts. I mixed twenty pounds of indigo with eighty pounds of imported vitriol. This chymic was sent out to more than twenty consumers, who all expressed great satisfaction of its quality. I then mixed ten pounds of the same indigo with forty pounds of the best American oil of vitriol, and the same consumers as uniformly condemned it. As none of them knew but that it was the same compound, there could have been no prejudice existing either in favour of the one, or against the other.

Chymic should be made in glass or stone ware pots. Common earthern ware will not answer, for the oil of vitriol dissolves the glazing. The compound may be made either in a sand heat, or in warm water. When the best oil of vitriol is procured, the next thing necessary is to obtain such indigo as is suitable to mix with it. A fine, light, compact, purple or violet indigo, either of Spanish or Bengal, should be obtained. The suitability of the indigo is best known by its rising moderately as the mixing progresses, but not too much, for when the effervescence is too strong, a portion of the indigo will be decomposed, and when very rapid, the whole; and that which is decomposed will not produce any colour, nor will it mix with either cold, or hot water, for the indigo appears to be completely carbonized. When it does not rise at all, (the mixture is incomplete, that is, the indigo is not properly in solution,) the goods dyed with it will be uneven, and the colour very fugitive.

It requires four pounds of vitriol to one of indigo. The indigo must be ground fine in a mill, or made fine by pounding in an iron mortar and sifting through a sieve. A small teacup full, or rather less of indigo, is put into the vitriol at once, and stirred until well mixed, and such quantities are added, from time time, until all the indigo is in solution. It must be well stirred during the operation, either with a glass or white willow rod. It has now to be covered down, and may be used the next day, after which it should be kept in ground stopped bottles, in which it will keep well for months.

It frequently happens that dyers will use more than four pounds of oil of vitriol to one pound of indigo. This is worse than useless, for as four pounds will dissolve one pound of indigo as completely as a larger portion of vitriol, the excess can produce no other effect on the goods than free vitriol will, and we all know this to be injurious to the goods dyed.

On the choice of Vessels for colouring scarlet as well as other delicate colours, and of Furnace Baskets, Reels, etc.

Scarlets may be coloured with safety, in vessels constructed either of brass, copper, or block-tin. When done in brass or copper vessels, they must be kept very clean, and the liquor must not be permitted to lie in the furnace after a day's colouring is finished. When a furnace is made of block-tin, it will have to be pretty thick, particularly at the bottom, and when the fire is drawn, after a day's colouring, the liquor in the furnace will have to be cooled down before emptying, the fire having been drawn sometime previous, otherwise the heat of the brick-work will so soften the metal that the bottom will fall out.

On Dying Furnaces, etc.

Before giving recipes for dying, it may be necessary to give directions how the cloth has to be prepared and worked, and the fires to be managed; for the goodness of colours depend as much on regulating such things correctly, as they do on the materials used to produce them.

On cleaning cloth for dying, and the washing of wool and cleaning colours after dying.

Many of the minor operations in dying, which those who are not well acquainted with the business are apt to neglect, as of little or no consequence, have an important bearing on the well-being of the whole. Such are the operations I am now about to describe, and I am sorry to have occasion to observe that very many of our manufacturers totally neglect cleansing their goods. I have before remarked, which cannot be too often repeated, that cleansing the wool and cloth well from all kinds of extraneous matter previous to dying, is a necessary preliminary to the production of good colours; and I must add, that to clear them well from the dye afterward, is no less necessary: when in wool, for the benefit of carding, spinning and weaving; and when in cloth, for the credit of the colours.

White cloth should always be cleansed well with fullers-earth before dying. The fullers-earth must be thoroughly dried before using, which may be done by spreading it on sheets in the sun, or by means of a stove-heat. When dry, place it in a tub, and throw as much water on as will cover the earth, which will cause the whole to melt into a pulpy mass. The cloth to be cleansed, has to have about as much earth thrown on the face, as is used of soap in fulling. It is then run for thirty or forty minutes in the stocks or washer, without water, and washed out in the same manner as will be described for coloured cloth. I must remark that before throwing earth on the cloth, it should be moistened as much as is usual for fulling.

When wool has been dyed, the light colours require only to be well washed in the swilling-basket; the darker colours, and particularly blue, should be first washed as directed for the light one, then soaked six hours, or more, in milk-warm water, with as much oil of vitriol in it as will give to the liquor a slight sour taste, and then it requires a second washing.

All the colours given to cloth, may be cleansed by streaming, or beating with sticks, from a bridge over a running stream, excepting blue and black, which require to be scoured in a fulling-mill. Each of these operations I shall describe, for unless the dyer has conveniences suitable to perform such operations, or is ignorant of what is necessary to be performed, he cannot expect to have it successfully executed. I have been much surprised that in works written on the subject of dying, the process for cleaning white and coloured wool, and cloth, should be passed over as operations of no consequence. It proves, what every practical artist must be well aware of, that a mere theoretical writer on the arts and manufactures, however splendid may be his literary talent, is not calculated to throw much light on the minutiæ of such subjects, and we all know that it is a combination of apparently trifling things that constitutes a whole.

The apparatus used for streaming, is a bridge six feet wide, and at least ten feet long, which is placed across a rapid stream, where the water is not less than eighteen inches deep. About sixteen feet below the bridge, a windlass is placed parallel with it, and elevated about sixteen inches above its level. At one end of the windlass is fixed a pully, three inches thick, and one foot three inches diameter; around this, holes are bored to place in four or five stout handles, which project about twelve inches from the solid pully, and a boy works the windlass by means of these handles. The cloth intended to be cleaned, is carried to the bridge on a slatted hand-barrow, by two men. The hand-barrow being placed on the bridge, the workmen throw the end of the cloth on the stream, and beat it until the water runs clear; they then take the end up, and fasten on some large twine, by means of a running noose, which twine is permanently secured at the other end to the centre of the windlass. The two men who carried the hand-barrow, having secured the twine on the cloth, throw the end to which it has been fastened on the water, placing each a foot on the list next to him, whilst the boy strains that part between the windlass and the bridge so as to keep it fairly on the stream; the two men are prepared each with a long pole, large and smooth at the lower end, to prevent their damaging the cloth, with which they strike it, in rather a slanting direction, and keep so beating until the water runs clear from it; they then lift up their feet to let another length upon the water, and the boy continues to wind up, always keeping it at a proper strain until the whole is off the hand-barrow. The cloth is then drawn back again, and the process repeated, if found necessary. For dark colours, this operation is repeated two, three, and even four times, or until the colour will not stain white paper. The men who work it, have wooden soles on their shoes an inch thick, the upper-leathers being fastened with tacks; but no iron or any other metal is allowed on the soles. They have also leather coverings to tie round their legs, from their shoes to a little above their knees, to protect them from the splashings of the water. In this way all colours, excepting blue and black, are cleaned, and so well are they done that the darkest brown, or the blackest bottle-green, will not stain the whitest linen. In towns where access cannot be had to streams of water, they fill large vessels, called backs, with water from pipes, and beat and rinse the cloth in it; but this is not half so effectual as the plan I have described.

Blue and black cloths are also streamed before taken to the fulling-mill, but never on the same bridges where other colours are worked. It is usual to have as many bridges as there are different classes of colours; one for scarlets, oranges and buffs; one for light drabs, one for dark drabs and browns, one for greens, one for blues, and another for blacks. Blue and black cloths, after being streamed, are taken to the fulling-mill and washed under the hammers, until the water runs clear from them, when they are taken out of the stocks, and hung upon long, large wooden pegs placed, in the walls of the mill-house for the purpose, where they are left to drain until the day following. They are then taken down, spread open, and wet fullers-earth thrown on all over the face; the lists are now thrown together, and they are carefully folded into the fulling-mill, which is plugged up, the hammers let down, and permitted to play on the cloth, without water, for half an hour, or forty minutes. The cloth is then handed out, the lists pulled square, the earth spread even on the cloth, and more earth added, if necessary. The cloth is then put again into the stocks, and the hammers suffered to play upon it one hour; after which, a small quantity of water is let run into the stocks, not more than would pass through a large wheaten straw, for half an hour, in order that the earth may be diluted slowly, and by degrees. After that, the cloth is once more handed out, the lists pulled square, then again put into the stocks, and the plug pulled out, when a full stream of water is introduced until it is perfectly clean. During the last operation, it is to be from time to time handed out, in order to prevent its taking a wrong position in the stocks, and being torn. The water that comes out of the stocks, shows whether the cloth is clean, for that which runs out towards the latter part of the operation, should be equally as clear as that which runs in. If on trying the cloth you perceive it still soils, it must be worked with earth a second time. River or clear rain water is the best to mix with the earth, and hard water for washing it out.

Scouring of cloth has of late years been performed by cylinders, and I am informed it can be as effectually cleaned in that way as by the old process. If so, it must be a great improvement, as with the utmost care the cloths cleaned in fallers were subject to more or less damage, whereas there must be gross negligence to allow of any when worked with rollers.

On the effect which Water has on Dying.

Whenever this subject has been mentioned by theoretical writers, it has been but briefly noticed, as a subject of minor consequence, and their opinions have been uniformly erroneous.

I had no conception when I left England, that water could have had so great an effect in the production of colour, as I have since found it to possess. I have practised the art in this country in four states, and have found that given proportions of the same description of ingredients, would not produce the same colour in any two; there would in each be a considerable variation in the hue and body of the colour. I shall endeavour to draw such deductions from the facts that have been developed during my practice in both countries, as will carry conviction to every unprejudiced mind; and I hope my opinion will be entitled to that consideration which the importance of the subject demands.

For confirmation of the fact, that waters differ so materially as to cause a change in the hue and body of colours, I will mention two circumstances that have come under my notice, one of recent occurrence, the other of many years standing. The latter occurred to Mr. John Parish, an eminent dyer in the west of England. He commenced dying in Gloucestershire, and could not succeed; he then began in Wiltshire, and for thirty years was the most eminent dyer in the country. After which he commenced again in Gloucestershire, and in a few years lost all he had made in Wiltshire, from an inability to make good colours. Since the publication of my former work, an experiment has been tried, that I think puts the opinion of the effects of water beyond doubt. A dyer from Gloucestershire, being determined to ascertain the difference in dying black in Wiltshire, had a blacking of broadcloth prepared in Gloucestershire, and the ingredients he used there weighed out. He took with him the cloth and ingredients, and made a dying at Trowbridge, Wiltshire, with the same ingredients he had always made good bright colours in Gloucestershire, but the colour produced in Wiltshire was a dead, flat, brownish, poor black.

An opinion has been handed down from the earliest writers, and repeated by every one to the present day, that no other than soft water is fit to be used in dying. They say that "if the water meant to be employed, is hard, and not fit for washing, or curdles soap, it is not fit for dying light colours." Although this idea has been taken for granted by every author, and has been as generally received by the most intelligent dyers, yet it is altogether erroneous; and I will venture to assert, that spring-water free from metallic oxydes, and marine salts, is, however hard, better calculated for dying, than any large stream having a distant source, however soft.

When I left England, I was impressed with the prevailing notion that none but soft water could be used for dying. It was the opinion of my father, and his predecessors in the same business, who have been eminent dyers for more than a century; and this in direct opposition to their daily practice; for they had all this time been making use of spring-water, that was very hard, would curdle soap, and was unfit for washing, in preference to water from a fine mill-stream, that ran between the dye-houses, and was remarkably soft. And I am convinced they owed their celebrity to this circumstance alone. My practice in America has convinced me of this important fact, that any water, with the exceptions before mentioned, may be used successfully by the dyer, with one proviso—that it is always in the same state. Water that is variable in its property, can never be used with any prospect of success: it is on this account that springs are better calculated for the purpose than mill-streams.

That river-water is ever varying, is too obvious to be doubted. After much rain, by far the greater part will be rain-water—in a dry season, nearly the whole will be the product of springs, and the shades of difference will vary almost daily. Can it be expected that a medium ever variable, should be calculated to produce certain and invariable results? The dyer who uses river-water (excepting in certain applications which will hereafter be mentioned) must, therefore, be subject to continual disappointment, and probably without the least suspicion of the cause. He will go blundering along for years in the dark, sometimes much to his satisfaction, at other times deceived in the expected results. He will blame the dye-wares; will think they have been adulterated by the dealer, or will charge his workmen with carelessness and neglect; any and every thing will be suspected rather than the true cause.

Let every American dyer, that is stationary, contrive some mode of obtaining water that shall always be in the same state, and I will venture to predict they will soon become as eminent as those of any other country.

In scouring wool, the water used in the furnace should be soft; afterward, for washing, hard water is to be preferred. Rain or river water is the best for one operation, and spring-water for the other.

In blue dying, soft water should be used in the vats. This exception is not on account of the colour, it is merely a saving of vegetable ferments. Hard water is best for washing wool after it has been coloured; it is preferable also for washing cloth after braying and fulling; and where a convenient supply of spring-water can be obtained at an easy expense, it should be led into convenient receptacles, from whence it can be drawn when wanted.

There is no colour in which water appears to have so much effect as in black. In the county of Gloucestershire, England, where the dyers are celebrated for this colour, the water holds in solution a considerable quantity of limestone; and the same recipes used there, when employed in the adjoining county of Wiltshire, where the water is impregnated with agillaceous matter, will not produce any thing like the same colour. There is also a sensible difference in the colour, in the same county, from any given recipe when used in different places, and even in various parts of the same stream; for the effect is not the same when used near the source of a river, as it is at a greater distance from it. I brought three different recipes with me from England, one from each of the three best black dyers in the county of Gloucestershire, and only one of the three would produce a tolerable colour with the water of a mill-stream in New-Jersey. The principal colouring matter in black is obtained from logwood, which appears to work browner in any other than limestone-water, and does not produce so rich a body.

As the opinion now given, has never to my knowledge been noticed by any writer on the subject, and involves consequences of great importance to the art, I shall attempt to explain the principle on which it operates, that scientific men, as well as dyers, may form an opinion on the subject. I do not presume to suppose my theory will be perfectly correct; but if it shall give a clue to enable others possessing more science to pursue the subject, and elucidate it with their usual perspicuity, it will, I hope, be the means of throwing some additional light on this intricate and mysterious art.

I have said that the waters in the county of Gloucestershire, where they are more celebrated for dying black, than in any other part of England, holds carbonate of lime in solution. After the cloth has been boiled with the dying wares, two or three hours for black, sulphate of iron and sulphate of copper are added, for the purpose of saddening the colour. As soon as these are thrown into the liquor, a violent effervescence is produced: the carbonic acid gas is separated from the carbonate of lime, by the lime combining with the acids of the salts, and there remains in the liquor a sulphate of lime, an oxyde of iron and copper, a sulphate of iron and a sulphate of copper. When colours are dyed in water containing no lime, nor any other alkaline earth, the salts in the liquor will remain in solution in the same compounds as before they were added to it. In the one liquor then, we shall have in solution, sulphate of iron, sulphate of copper, sulphate of lime, oxyde of iron and copper; in the other, sulphate of iron, and sulphate of copper.

Every chymist must know that a material difference in the colour will result from these two compounds. The sulphate of lime in the first, will raise the blue of the logwood, and thereby increase the body and intensity of the colour on the goods dyed. I have made two or three attempts to substitute caustic, and sub-carbonated lime-water, in place of the natural; having previously inferred that a similar effect would be produced. I found it to raise the colour of the logwood, yet for want of sufficient experience in its use to fix a proper standard, I have never been able, successfully, to imitate the natural water. I have discovered, however, that when too much was used, it had an injurious effect, making the logwood tincture of a pale prussian blue colour.

The most important deduction to be drawn from these facts, is, that dyers ought never to expect that recipes obtained from other countries, or from distant parts of their own, should produce exactly the same colours when used by them, as they have with others. And also, that for dyers to become eminent, they must be stationary, they must continue to practice in one situation, and with one kind of water, that by these means alone, can they be expected to obtain perfection in the art. It is, nevertheless, useful to become acquainted with the practice of others, and more particularly with the science of chymistry, on which the art is founded; but they must not implicitly rely on any thing but their own practice.

The difference in the effects produced, between dying from any recipe in one place and in another, may, and does often arise from other causes beside the variableness of the water; see scouring of wool, cloth, &c.

On Cochineal and other Dye-Stuffs.

There is so much difference in the quality of cochineal, that it is impossible to describe it accurately, and nothing but practice in comparing samples, and dying with it, can give that critical judgment which will enable the dyer to make choice of those that are the best suited for colouring. The French prefer the silver gray; in England the black grain is preferred. I do not believe there is any essential difference between them. In choosing cochineal, the dyer should be particular in having a large solid grain; a small, or shelly grain, indicates an inferior article. Cochineal, being costly, is subject to great adulterations; there is often found in it a gummy-looking substance, having no colour; and sometimes stones are found in it as large as the fly. Every sample before purchasing should be examined attentively, and all suspicious substances separated from the real fly and broken, which will disclose the imposition, and enable the consumer to judge of the adulterated percentage. It is usual, when different samples are offered, after the adulterations are ascertained, to reduce each one separately into a fine powder, and to form a judgment of their relative value by their comparative shades of intensity.

Cochineal is ground in a steel-mill kept expressly for the purpose, which is never permitted to be used for any other articles.

For the finest scarlet, intended to be very rich in colour and body, no colouring matter should be used, excepting cochineal; but in general colours the manufacturer will not go to that expense, therefore, some yellow has been used to assist the body of the colour: such as young fustic, black-oak bark, and turmeric.

Turmeric is brought from tropical countries; it is a bulbous root, and when broken by the hammer, should be of a fine golden yellow. If the roots are new, and have not been much exposed, the outside will have a yellow appearance; but if old, they will be of a dirty drab; and the value of the drug will be in proportion to the distance this abstraction of colour has penetrated the root. It is not a little singular, that the root most esteemed in England should be considered of inferior value in this country.

Lac dye has been generally used since my former work was published. It is imported from the East Indies in square cakes, and can be used at less than half the price of cochineal. The scarlet obtained from the lac dye is equal to that from cochineal; but its application is limited to reds and scarlet, for it cannot be used to advantage in either pinks or crimsons, as it will not blue by the addition of alkalis.

Brazil, or Pernambuco wood—it was formerly the sole property of the crown, and every piece was stamped at one end. It is mostly used for rose colours, crimsons, and for making red ink. There are two distinct woods called brazil, one known as king's wood, the other as queen's wood, the latter being worth three or four times as much as the former.

Madder is imported from Smyrna, Holland, and France. The Smyrna is considered the best, the Dutch the next best, and the French the worst. The finest quality of French I have found to be equal to the best quality of Dutch; but there the equality ends, for the second grade of French gives one third less colour than the second grade of Dutch.

I am informed that the madder-root grows wild, over large districts of country, in South America. I received a sample of madder-roots, some four years since, from South America, which on trial proved far superior to any European madder. I pounded the roots in a mortar, and tried it in comparison with some prime Dutch crop, when the South American gave a colour far exceeding the other.

Dutch madder, when ground, is separated into four distinct grades, the crop, the umbro, the gamene, and the mull, and in each of these there are many different shades of quality. The umbro and gamene are mostly used in woollen dying, for all common colours, and for the blue vats; the crop is used for fine reds, and the mull for dark bottle-greens, dark browns, and for dirty drabs.

The outside of casks of madder are always more or less damaged by access to the air through the seams between the staves, and when sold in Europe an allowance is made for what is called crust. The injury a cask has sustained, may be discovered by boring in from the bilge to the centre of the cask, and drawing the borer out full of madder. By examining this, an estimate is formed of the average loss. Supposing a cask of madder of three feet in diameter is offered for sale, having a damaged crust of two inches, the consumer who buys it, without an allowance, will be a loser of nearly twenty per cent.

Most of the blue dyers in this country, are under an impression that madder, by giving out its red dye to the liquor, produces with the blue a rich purple colour; but in this they are mistaken; for madder, immediately after it is put into the vat, ferments, and in a few hours loses all its colour; so that those who use the best crop madder under this impression, are contributing to the expense of the dye without any equivalent.

Attempts have been made to raise madder in this country, and in some instances successfully. Those who use large quantities, should cultivate it for their own use. The discovery made by M. D'Ambourney, that the fresh roots may be used with as much advantage as that which has been dried and powdered, allowing four pounds for one, would make the price of madder come very low to those who would raise their own. Before using, it should be bruised in a mill, similar to that in which apples are ground.

Mungeet is imported from the eastern continent, in bales. This is a species of rubia, and of course belongs to the class of madders. It is in long roots of the size of a pipe-stem, and smaller. The colour it affords is similar to that given by madder, excepting it being rather more on the red. This article has been much used since madder has risen in value, although it was before totally neglected.

In making choice of indigo, the dyer should attend to its specific gravity, and to its fracture and colour. That which weighs the least for its bulk, is smooth in the fracture, and appears of a bright violet, purple, or bronze hue, is the best. The qualities in this drug are so unlimited, that it requires much practical skill to make purchase of the most profitable article. The finest qualities of indigo generally demand a price far above their intrinsic value; and dyers usually buy the consumable qualities, from which they obtain more colour, in proportion to the price, than from the finer qualities.

The indigo that is used in a fermenting vat, should be ground to a fine paste in water. This may be effected either in a cast-iron pot, with balls turned by a crank, or with a mill, such as is used to grind printers' ink. The indigo should be previously soaked, by putting it into a tub, and filling up with boiling water, so as to cover it. When this has been in soak for three or four days, the indigo will be so much softened as to crumble when moved, and when handled, will break by the slightest pressure of the fingers.

The ball-mill I need not describe, as every dyer is acquainted with it; the shape of the mill in general use here is very bad; the bottom where the balls work, should swell, or belly out, and the pot should narrow a little towards the top. A pot of this shape would never permit the indigo to be thrown out by the balls, when in motion—a defect very common in the bell-shaped pots used in this country. An indigo mill-pot, where more than one vat is intended to be employed, should be large enough to grind thirty pounds of indigo at one time, with two balls, each seventy pounds weight; these, if kept in constant motion, will completely grind that quantity in three days. The printer's, or stone-mill, must have an iron breaker, through which the indigo may pass before it enters the stones; and the finer it is broken by this, the easier and better it will grind.

There are four kinds of logwood, the Campeachy, St. Domingo, Honduras, and Jamaica, known by the names of the places from whence they are exported. The Campeachy is the best, St. Domingo the next best, and the Honduras and Jamaica are both inferior woods. It is considered that three pounds of Campeachy is equal to three and a half of St. Domingo, and to four of Honduras and Jamaica. Notwithstanding the inferiority of Honduras and Jamaica, they are more generally bought by large consumers than Campeachy, from the well-known fact, that manufacturers of wood in England, always adulterate Campeachy logwood with at least half of Honduras and Jamaica.

Camwood is never used on woollens in England. It was once used there, but has been rejected, because it injures the quality of the goods more than twice the value of the cost of dying. It has been superseded by that of barwood.

Redwood is but little employed in woollen dying, excepting in some peculiar colours, as will be seen in the recipes for dying. What is called redwood in this country, must be a different wood from that which bears the same name in England; for redwood is much dearer there than Camwood. It is the same as is here called hatchwood, with the sap taken off.

Peachwood is the same as is here known by the name of nicaragua, and the quality depends on the size of the wood. It is rarely used on woollens, excepting in colours having a purple hue.

Red sanders is now much used in rich browns. It not only gives a beautiful tint, but is one of the most permanent of the vegetable dyes.

There are several qualities of fustic, the Cuba and Tampico are the best.

Weld is raised in France and England, from whence small lots are occasionally imported into this country, and sold at from five to seven cents per pound. Since my former work was published, this plant has been raised by some of our farmers, but in general has not been well cured.

Dr Bancroft has taken much pains to prove that the quercitron, or black-oak bark, will give a colour equally as good as the weld; but English dyers are convinced, after having tried the two, that the weld gives a more beautiful, and a more permanent colour. There is another property in weld, which gives it a decided advantage over the black-oak bark; it imparts a softness to all woollens coloured in it, which no other colouring matter does in the same degree.

Dyer's weed grows wild on commons, and around the borders of woodland; it has much the appearance of heath, and is known in England by the name of woodwax. It is much used in drabs, in the parts of England in which it grows.

Green ebony is imported from the Pacific. It is a green-coloured wood, and is much used in greens, olive-browns, and many other colours having a green hue. It is generally employed in dying green silk.

Young fustic is the sticks, or woody part of the venice sumach, and is sold cheap in England. The sap is white, whilst the inside is of a rich orange yellow. It is used in chips, and principally employed for oranges, auroras, &c. &c.

This plant grows well in this country, and is to be found in most gardens and shrubberies, of any note. Its technical name is *rhus cotinus*. The stem and trunk of the shrub, and the root, are bought and employed for dying. The leaves and stalk, when bruised, have an aromatic but pungent and acid scent. It bears a flossy blossom, but no berries, and the leaves are round. Any dyer having an acre of land to spare, might raise sufficient for his own use.

On Native-American Dye Drugs.

There are, no doubt, a great number of dying drugs in this country, which, if known, might become valuable. It is much to be regretted, that some institution does not exist in this country to test and bring to notice its native colouring matters. In the hands of a practical and theoretical dyer, many valuable discoveries might be made of new dyes now lying dormant. Many of them might be used to advantage by the dyers of this country, and also become objects of some magnitude, as exports. It would require an appropriation of two or three thousand dollars per annum to effect the object, and I should apprehend that five years would be sufficient to test all the colouring matters of the United States.

I am now acquainted with seven native dye drugs: the sumach, swamp-maple bark, black-oak bark, golden rod, alder bark, chestnut bark, and butternut bark.

Sumach.

The common sumach, so abundant in this country, and which is so generally gathered for dying, is of a different species from that which is imported. It is the *rhus glabrum.* The imported is the *rhus coriaria.* The latter looks much yellower when ground than the former, and works more powerfully. It grows naturally in Syria, Palestine, Spain, and Portugal, and is found occasionally in this country. It is diligently cultivated in Spain and Portugal. The shoots are cut down to the roots every year, and dried, that they may be ground to powder in a mill.

Swamp-Maple Bark.

This bark is used in drabs, grays, and blacks. It may be employed in almost all cases, as a substitute for nutgalls. Four pounds of swamp-maple bark will give full as much colour as one pound of the best nutgalls.

Black-Oak Bark and Golden Rod.

These are used for yellow, and the mode of dying is the same for each. The use of the black-oak bark is well known among our dyers, but the golden rod, producing a better colour, has been very little attended to. I would recommend our dyers to gather the plant when at maturity, and use it in a dry state.

Alder Bark.

The alder is found abundantly in swampy places; it is generally of small growth, and has a motley nut-brown bark; the sticks are cut in the month of April, or the beginning of the month of May, when the sap runs; the bark is stripped off as soon as cut, (which is easily done by children) and is dried in the shade, when it is fit for use. The poles make good bean-sticks, or excellent firewood. This bark, when the colouring matter is strong, produces a brownish drab with alum, and a light forest drab when only a small quantity is used. When employed in the black dye, it increases the body of the colour even more than sumach, and is equally durable.

Chestnut and Butternut Bark.

These barks are used in browns and blacks. The butternut is mostly employed to give a body for brown. It gives a good cinnamon-brown, of great permanency, without any mordant, and could be used to much advantage as a preparation for browns of almost every shade.

White-Oak Sawdust.

The sawdust of the white-oak gives the best and most permanent body to blacks, of any material I have ever used, and is not so apt to turn brown, as sumach, oak bark, or any other material in common use. It requires about twelve pounds to twenty yards of broadcloth, weighing twenty-four pounds, or half the weight of the cloth. The purple, given by the sawdust, is finer than that which is obtained from nutgalls, and is highly permanent.

There is an acid in wood, called the pyroligneous, which is much used, when combined with iron, for dying and printing of black on cotton. It is highly probable, that when oak or other sawdust is boiled, this acid is extracted, and operates in producing the colour, in addition to the purple obtained as a colouring matter; for it is well known, that pyroligneate of iron is the best mordant used in black dying.

On Dye-Stuffs, not indigenous, that could be raised in this country.

Indigo, madder, weld, woad, woodwax, and many others, might be raised to advantage in this country.

On the manufacturing of Indigo.

The value of the indigo consumed in this country, cannot be estimated at less than two millions of dollars per annum.

The quantity of indigo made from an acre of the plant has been differently estimated by almost every maker from whom I have obtained information. Taking the average of the different estimates, it would be at least fifty pounds to the acre. It will appear by this estimate, that it would require forty thousand acres of land to raise a supply for present consumption; and as the demand is rapidly increasing, it is more than probable, that in ten years, it will require the product of eighty thousand acres to raise a supply for home consumption.

There are four points to be attended to in making of indigo, which require much judgment, aided by practical skill These are, the time of cutting the plant, the degree of fermentation to be given in the steeper, the degree of oxydizement of the colouring feculæ, and the extrication of foreign matter from the pulp after the indigo is made. Three of these processes being purely chymical, it is not, therefore, surprising, that ordinary workmen should frequently fail in producing a good article. There is probably more loss sustained by our southern planters, from the ignorance of the operators, than the whole value of the article now sold.

The plant should be cut when at maturity, as it will then afford a fine colour; but if cut too late, a portion of colour is then lost, and an indigo of worse quality is obtained. Mr. Dalrymple informed me, that the plant should be cut when in full flower, after the weather for some days has been dry.

Another celebrated maker of indigo, asserts, "that if the plants are suffered to stand till they run into flower, the leaves become too hard and dry, and the indigo obtained from them proves less in quantity and less beautiful. The due point of maturity is known by the leaves beginning to grow less supple, or more brittle."

It appears that the makers of indigo differ as to the time of gathering the plant. It is greatly to the interest of our planters that they should ascertain, by direct experiment, the proper time of gathering.

When the plant is gathered, it has to undergo a process by immersion in water, for the purpose of extracting its colouring matter. This operation is performed in two ways—by fermenting the green plant in a steeper, or by first drying the leaves and then simmering them in a boiler. The latter process is now pursued by some of the best makers in Bengal, and has apparently an advantage over the old process.

When the green plant is fermented in a steeper, and the process is carried a little too far, the colouring matter will become dark, and is said to be burnt—if carried a slight degree farther it will be black, and of course the indigo will be very much injured. Nine-tenths of the indigo made in the United States, partakes more or less of this character, and has evidently been injured by an excessive fermentation. To observe a due degree of fermentation in the steeper, is the most difficult point in the whole process of making indigo; for should the fermentation not be carried far enough, a considerable loss of colouring matter will be the result. It is necessary, therefore, to carry it on to a certain point, and to draw it off the instant it arrives at that point; and this can be known only by a skilful observer who has obtained his knowledge by practice.

There is no chymical operation so difficult to describe as that of fermentation, and I almost despair of making myself clearly understood by practical workmen in the following description of the steeping process.

Fermentation has been divided by chymists into four kinds, or stages: the panary, vinous, acetic, and putrefactive. The fermentation given in the indigo steeper is evidently of that kind called panary, or the first stage of fermentation. It is known to be the panary by the large quantity of carbonic gas given out, which, rising to the surface, floats on the top, covered with a thin pellicle of the liquid. The difficult point for the operator to distinguish, is when it arrives at that degree of fermentation, and begins to assume the acetic. The same difficulty occurs with the woollen blue dyer, and the losses so frequently complained of, by the vats being out of order, and often irrevocably lost, arise from the fermentation being permitted to proceed too far.

The following directions are given as a guide for those who may be engaged in the making of indigo. Whilst the plant is in steep, draw off a little of the water, and with a pen dipped in it make a few strokes on white paper. The first will probably be highly coloured, in which case the indigo is not sufficiently fermented. This operation is to be repeated every quarter of an hour, until it loses its colour, when it will have arrived at its true point of fermentation.

Let a small hole be made in the steeper, six or eight inches from the bottom, exclusive of the opening or aperture, for drawing off the impregnated water. Let this hole be stopped with a plug, yet not so firmly but that a small stream may be permitted to ooze through it; after the plants have been steeped some hours, the fluid, oozing out, will appear beautifully green, and at the lower edge of the cistern, from whence it drops into the battery, it will turn of a copperish colour. This copperish hue, as the fermentation continues, will gradually ascend upwards to the plug, and when that circumstance is perceived, it is proper to stop the fermentation.

During the progress of this part of the business, particular attention should be paid to the smell of the liquor which weeps from the aperture, for should it discover any sourness, it will be necessary to let the fermenting liquor run immediately into the battery, and lime-water of sufficient strength must be added, until it has lost its sourness. As it is running off it will appear green, mixed with a bright yellow or straw colour, but in the battery it will be of a beautiful green.

Another maker has given the following description of the fermenting process.

When the plant is gathered, a large quantity is put into a vat, and some wood laid above to prevent its rising above the water. The mass begins to ferment sooner or later, according to the warmth of the weather, and the maturity of the plant—sometimes in six or eight hours, and sometimes in not less than twenty. The liquor grows hot, throws up a plentiful froth, thickens by degrees, and acquires a blue colour, inclining to a violet; at this time, without touching the herb, the liquor impregnated with the tincture is let out, by cocks in the bottom, into another vat placed for that purpose, so as to be commanded by the first.

The boiling process, for extracting the colour from the dry plant, was obtained from Mr. Dalrymple, who had for many years been an extensive indigo maker in Bengal. He says: take an iron, brass, or copper boiler, fill it within three inches of the top with the plants, press down with stones, and cover the plants with water. The liquor must be heated, not until it boils, but until it begins to blubber, or simmer. The water, by this time, will look greenish, then draw it off into a shallow vessel or vat, and beat for one or two hours to incorporate oxygen with it. On taking some of the liquor in a white saucer, little particles will appear in it as large as a pin's head and smaller; then stop beating and throw in a little lime-water, upon which the indigo will precipitate to the bottom, and the supernatant water will look like brandy. The water has now to be drained off to a level with the top of the sediment; lay the sediment on a cloth to drain, and when stiff enough put it into moulds to dry.

The directions given by Mr. Dalrymple are evidently imperfect, for none are given for the fermenting process; and those who are the least acquainted with the manufacture of indigo, must know that the colouring matter cannot be developed unless the liquor has previously undergone a due degree of fermentation.

I have been recently informed, that many first-rate makers of indigo in Bengal condemn the process of obtaining it from the dried leaves, on the plea that the article obtained is no better, and is much less in quantity. If any of our planters should be disposed to try the dry process, it will be necessary to inform them, that should the leaves, between gathering and drying, be subject to fermentation, only a small portion of colouring matter will be obtained, and that the loss sustained will be as to the degree of fermentation.

During the precipitation of the colouring feculæ, the coarsest particles, possessing the greatest specific gravity, subside first, constituting the lower strata of the pulp; and the lighter and finer particles, subsiding last, form the upper part. It is necessary that indigo makers should take advantage of this circumstance, by first taking off the upper layer, and moulding it by itself, and the lower part by itself. By this means they may obtain several qualities of indigo from one mass of pulp.

It appears from analysis made by Bergman, Quatremere, and other chymists, that indigo of good quality does not contain more than from 46 to 47 per cent. of colouring matter, and that the very best samples do not contain more than 48 per cent.

The following table will exhibit an analysis of indigo of a good quality, and of the menstruua in which the impurities are soluble:

Mucilaginous parts, separable by water, ...	12
Resinous parts, soluble in alcohol, ...	6
Earthy parts, soluble in acetic acid, ...	22
Oxyde of iron, soluble in muriatic acid, . . .	13
Colouring parts, almost pure, ...	47
	100

There cannot be a doubt, that the manufacturers of indigo might produce, by attending to the analysis made by chymists, an article far superior to any hitherto offered to the public. It will also appear certain, when experience shall have confirmed the value of a superior indigo, that a more than remunerating price could be obtained for a purer article. For certain purposes a pure indigo would command double, and even treble prices, provided the supply were not too great for the consumption. This being the case, it would be well for our manufacturers to pay some attention to the subject, and endeavour, by some easy, unexpensive process, to bring it to as great perfection as possible. To promote this object, I offer the following extracts and observations.

Bergman dissolved, by means of ebullition in water, a ninth part of the weight of indigo.

Quatremere also separated, by means of water, the parts which are soluble. He states their quantity to be more considerable, the worse the quality of the indigo; and that, after this operation, the residuum has acquired the qualities of the finest indigo. He, therefore, proposes to purify what is of inferior quality, by boiling it in a bag, and renewing the water till it ceases to acquire colour.

If sulphuric acid be diluted with water, it attacks only the earthy matter that is blended with the indigo, and some mucilaginous ingredients.

Muriatic acid, digested or even boiled with indigo, takes up the earthy part, the iron, and a little extractive matter, which colours it of a yellowish brown, but without attacking in any manner the blue colour.

It is evident from the analysis, that to make indigo far superior to any now brought to market, requires only an application of known facts to the art of making it. It is a well ascertained fact, that if indigo is boiled in water containing muriatic acid, twenty-five per cent. of the impurities contained in the best samples, would be extracted, and the colouring matter remaining would form an indigo far superior to the best now offered for sale.

In the best samples of the indigo of this country there is evidently too much extractive matter, and there is no doubt that this defect arises, in a great measure, from their taking the pulp from the beater, instead of their running it into a vat of clear water, and after well agitating there, letting it settle in the third vat. This third receiver should undoubtedly be added where it has not been done already. Those manufacturers who would wish to avoid the expense of a third receiver, may fill up the beater with fresh water, after drawing off the first liquor, and perform the operation in the same vat.

The greatest improvement I can at present suggest, would be to boil the pulp taken from the vat by steam heat, for fifteen or twenty minutes, in water containing as much muriatic acid as would give to the liquor a strong acid taste. This operation can also be performed by placing a copper pipe in the beater from any steam boiler.

Muriatic acid, besides the oxyde of iron, dissolves the carbonate of lime, red resin, and alumina, contained in the indigo, and by being mixed with water, the greater portion of the extractive matter would be taken up at the same time. It would leave the indigo twenty-five per cent. better than any hitherto made, and a price more than equivalent to the loss of weight and expense would be readily obtained from the consumer.

I have been informed by some South Carolina planters, that owing to their inability to proceed with the fermentative operation as rapidly as the crops require, a portion is often left on the fields for two or three weeks after the plants have arrived at maturity. This circumstance alone is sufficient to blast the interest of the planters. This difficulty is obviated in Bengal by their planting their seed in successive periods, so that one crop will ripen a week or more after the other, each crop being sufficient to supply one set of tanks during the period of maturity.

Dyers, as well as indigo planters, would be highly benefitted by attending to the analysis of indigo. Were they, when a superior colour is wanted, to boil the ground indigo in a bag as described by Quatremere, there would be no difficulty in obtaining the desired result from indigo of any quality.

On raising Madder.

As manufactures progress, many agricultural products will be brought into demand, which, from the variety of our soil and climate, may as well be raised in this country as in any other; and it is the interest of our agriculturists to seize every opportunity of cultivating new products, as soon as a sufficient demand is created to warrant the attempt.

Madder has become an article of great consumption, and the demand is daily increasing. That it can be raised in most parts of North America, in the greatest perfection, has been tested by experience. Mrs. Madison made a report to the Philosophical Society of Philadelphia, many years since, of madder raised under her direction, and the report was accompanied with a sample of cotton dyed of an adrianople red, that has never been exceeded in colour by any European dyer. In Kentucky, madder is commonly raised in gardens, is dried in the root, and sent to market for sale. I once used a few pounds of those roots, and the colour obtained was equal to that produced from the second quality Dutch crop.

I have selected information relative to the cultivation of madder, for the guidance of those who would wish to make the attempt.

It will be necessary to plough the land deeply for madder, before the winter, into high ridges, in order that it may be exposed to the action and influence of the frosts, and the atmosphere. Early in the spring these ridges should be well harrowed down by a heavy, long-tined harrow, and then ploughed again in the contrary direction to a good depth. And when after this, the land is not perfectly clean from weeds, or not rendered sufficiently fine and mellow, another ploughing and another harrowing should be given. In the last operation the ground should always be left in as level and even a state as possible. It is then ready for the reception of the plants. The sets or plants may then be obtained either by sowing the seeds upon a bed of earth which is rich, and made perfectly fine by digging and raking in the spring, and then lightly covering in, or from offsets or suckers from the old plants. In the first method, on the plants appearing they should be made perfectly clean by weeding, and set out at the distance of three inches in the beds, by the hoe. In this way, by keeping the ground quite clean and well stirred about the plants, they will be ready to set out in the second autumn, though it will mostly be better to defer the business until spring. It requires about thirty thousand plants for setting an acre of land. The most suitable time for taking the sets is shown by the plants having attained the height of ten or twelve inches from the ground, and the suckers having thrown out fibrous roots from their bottoms. This may be seen by drawing up a few of the plants, and usually about the latter end of May or beginning of June. Besides, it is necessary that the sets have formed root-fibres at the bottom, before they are removed, as where that is not the case they never succeed well. The land being previously prepared as directed, and the plants provided, a sufficient number of labourers are to be employed, that the work may be performed as expeditiously as possible. In taking off the sets, much care is necessary not to injure them. The number of plants that can be set in a short time, should be taken up at once. They should be prepared by having a third part of their tops cut off; a sort of thin batter should be made by mixing good vegetable mould and water well together, into which the roots of the sets should be well dipped before they are placed into the earth, as by this means the necessity of watering the plants afterward is prevented. This work is executed by a person before the planting commences. Two others are employed afterward in distributing the plants so as to be convenient for putting them into the ground.

These sets, after the land has been formed into beds, five feet in breadth, with two feet between each, for intervals, are put in by means of a line and dibble, beginning at a distance of six inches from the outside, and setting a row of plants a distance of five, six, or more inches from each other; then removing the line two feet further on them, and putting in another row, and so on, until the bed is finished. In this way each bed contains three rows of plants, at two feet distance each.

As some of the plants are liable to die soon after the work has been performed, it is necessary, in the course of two or three weeks, to look over the ground and put fresh vigorous plants in the places where the others have been destroyed.

It is of the greatest consequence that the plants be kept perfectly clean, and the mould occasionally stirred about the roots of the plants.

Manufacturers, by using the green roots as recommended by D'Ambourney, would make a saving of full one-half of the expense now incurred, by raising their own madder. It would require four pounds of green, in place of one of dry madder.

On the Weld Plant as a dye, and its cultivation.

The weld plant is so valuable a dye-stuff for woollens, for drabs, browns, olives, yellows, greens, &c., that I think it necessary to call the attention of our dyers to its application, and of our farmers to its cultivation. Weld, or would, *resida leuteola* of Linnæus, is a plant used by dyers to give a yellow colour. Some parcels of this plant have been imported; but owing to its excessive bulkiness, it never can be brought from Europe at a price that will enable our dyers to bring it into general use. As the plant, however, can be raised here much better than in England, the summer being warmer and drier, it may be cultivated and sold at as low a price as in any other country; there is, therefore, no impediment to its being generally adopted by American artists.

That nothing may be wanting to facilitate the use and cultivation of this valuable dye-drug, I shall point out to our dyers its most prominent properties, and to our agriculturalists the mode of cultivating it.

The colour obtained from weld is more permanent, with the common mordants alum and tarter, than any other yellow dye. The colour it gives is also more delicate than any other; but its chief superiority consists in the property it possesses, in a very superior degree, of imparting a great degree of softness to the woollens dyed with it. Our manufacturers cannot but be aware of the advantage of using such dyes as will give a softness to their wool, in preference to others, which from astringency have the effect of giving a harsh feeling to their fabrics. So much are European wool dyers impressed with the superiority of weld over any other yellow dye, that they use it in all furnace colours that will admit of it, though it costs them more than double the price of other dyes, for which it is substituted. The drabs dyed with weld are more permanent, and the colours more delicate than from any other yellow. The olive-browns and greens, and the bronze greens, are in every way superior, as it respects their brilliancy and permanency. When used for wool colours, the wool is found to work softer and better in every subsequent operation.

Weld is greatly preferred to all other substances in giving the lively green lemon yellow. It is much used by the London and French paper stainers. Diffuse any quantity of fine whiting in boiling water, add to it one ounce of alum for every pound of whiting, and stir these materials well together until the gas is disengaged. Boil in a separate vessel some weld, with water just sufficient to cover it, for fifteen minutes, filter the yellow decoction, and mix it with the whiting and alumine. The precipitate is used for staining of paper.

The soils most suitable for raising of weld are of the fertile mellow kinds, whether of the loamy, sandy, or gravelly sorts; but it may be grown with success on such as are of a poorer quality. In fact, a light quick soil, approaching to the sandy, is the best; for the smaller the plants, provided they blossom well, the better. A soil rather moist, but mellow, seems the most suitable and proper for it.

It is necessary, in the preparation of the ground, that there should be a tolerable degree of fineness in the mould of the soil, which may be effected by repeated ploughings given in the more early spring months, and suitable harrowing. The surface of the land in the seed-furrow should be left as level as possible, that the seed may be dispersed more evenly over it, and with greater regularity and exactness.

From two quarts to a gallon, is sufficient seed for an acre, according to circumstances, when sown alone; but when sown with other crops, a little more may be required, which should be blended with a little sand, or some such material, at the time of sowing it, to render it capable of being sown more evenly. It may be sown in the spring, or in the latter end of summer, about the beginning of August.

In Norfolk, England, it is sown with other crops, such as barley, buck-wheat, beans, peas, clover, or grass seeds—it is usually put in after them; in some cases immediately, in others not until some time has elapsed.

The plants do not usually run to stalk until the second year; it is ripe by the first of June. After they have blossomed, just as the last begin to fall off, the plants are pulled; they may be set up in small handfuls to dry in the field. That which is left for seed should be pulled as soon as the seeds are ripe, set up to dry, and then beat out for use; for if the plants are left too long the seeds will scatter.

Woad.

This plant has been raised in this country for some years and is sold by several agriculturalists in the neighbourhood o

Hartford, Connecticut. The principle error committed by the makers, is in packing the woad too moist after couching.

Woodwax.

In some parts of England, this plant grows wild on commons, and around the borders of woodland; it has much the appearance of heath, and is known by the name of woodwax, or dyers' broom, a species of erica. This plant is used altogether in drab dying.

Sweet Balm.

The flowers of this plant (monarda dydima) will colour a pink nearly equal to saff-flower, and quite as permanent. It should by all means be brought into use. A small plot of ground would produce a large quantity of flowers, as it continues to blossom for two or three months.

To prepare Woollen Goods for the Furnace.

In the first place the cloth has to be well cleansed from all soap and grease, by scouring it with fullers-earth, and washing the earth out quite clean with water. It should be understood by the workmen, that soap left in goods to be dyed, is as bad as grease. Cloth, yarn, or wool, should always be moist quite through before entering the dye-furnace.

On Black Dying

Black is a compound colour, made from dye-stuffs containing a purple tint, and such as give some drab or yellow. Nutgalls, sumach, logwood, and several other dyes, give a purple; and fustic, or quercitron bark, gives the yellow. Such dye-stuffs will not give a black colour without the aid of metallic oxydes. Copperas, blue vitriol, and verdigris, are the salts generally used, from which the metallic oxydes are obtained. The intensity of a black colour will, in all cases, depend on the perfection of the oxyde. If, when copperas is used, the iron is oxydized to its maximum, it then produces a black of the utmost degree of intensity; but if, from any defect in the process, the metallic substance used should be oxydized below that point, the black will be defective, and the deficiency will increase as the oxydizement diminishes. The same effect is produced by all the metallic salts, in whatever state they may be used, whether as acetates, sulphates, or nitrates. It is for the purpose of oxydizing the metals of the salts used, that in woollen dying the cloths are exposed frequently during the time of saddening, and that in cotton dying the goods are dried and exposed to the atmosphere for several days.

A new mode of bringing up the oxyde of the metal of metallic salts used for black dying, has lately been discovered, which is very valuable to dyers in general, and particularly so to the cotton dyer.

This effect is produced by dissolving two pounds of chloride of lime (bleaching powder) in four gallons of water; to be well stirred, then left to settle, and pouring the clear liquor into one hogshead of water. By running any goods, previously saddened, through this liquor for a few minutes, the metal immediately becomes oxydized to its maximum, and the black produced is more intense than those by the common process.

This process will be found highly advantageous to the black cotton dyer, as it will save him much time and trouble.

It is further applicable in all colours wherein metallic salts are employed. In prussian blue colours, its effect is strikingly beneficial.

This fact was discovered, and made known to me, by Messrs. William Adams & Co. of this city, and I consider it as a very important discovery.

As a guide to black dyers, I consider it necessary to inform them of the result of a series of experiments, by which some French chymists ascertained the quantity of copperas necessary to saturate a given quantity of the principal dye-stuffs used by black dyers. It will be necessary to inform them, that when more than sufficient to saturate is used, the colour becomes brown, or what dyers would call russet.

To saturate ten pounds of nutgalls, requires two pounds of copperas. Ten pounds of sumach requires one pound five ounces; and ten pounds of logwood, one pound five ounces.

There are four different and distinct colours in black: the blue, the yellow, the red, and the jet black. It will be necessary to keep this distinction in view in reading what follows, as well as in the practice of the dyer; for as it includes all the primary variations that can take place in the colour, it will have a tendency to lead the mind to the cause of the difference, and thereby remove that confusion which too many artists in this line are labouring under. The terms I have used to distinguish the different shades of this colour require no explanation—the blue, red, and yellow, being the dyer's primitive colours; every one must know, that when either of these predominate, the colour assumes that name. A jet black is that happy mixture of the three, in which neither of them is in visible excess.

To dye a blue-black on sixteen pounds of cloth or yarn.

For boiling, use six pounds of logwood, fourteen ounces of sumach, and two and a half ounces of pearlash.

Let the contents of the furnace be well stirred with a rake after the dye-wares have boiled two hours. Cool down the liquor to one hundred and eighty degrees or thereabouts—then enter the cloth rapidly, and give it a few turns over the reel as quick as possible, having it kept open all the time by the broadsman. The fire is then to be made up as strong as possible, and no time lost in bringing the liquor to a boil. After it boils out fairly, the time must be taken, and the boiling kept up for two hours, the workman keeping the cloth open all the time. When it has boiled two hours, the furnace must be filled up with cold water, the door thrown open, and the cloth taken out and well cooled. Whilst this is doing, the fire is made up, the door closed, and the liquor brought to boil. The materials to be used at this time are, one and a half pounds of copperas, and four and a half ounces of blue vitriol, (not more than five and a half ounees.)

After the liquor, with these ingredients, has boiled five or six minutes, the door is to be opened, the liquor cooled down with water as before, and after well stirring the liquor the goods are to be entered rapidly. The reel should move briskly for the first fifteen minutes, one person being employed to push the cloth under the liquor on one side, and another on the other side to keep it open; the reel to be kept turning, and the cloth kept open during the whole of the operation. In order to avoid repetition, I must, once for all, inform the dyer, that in all piece dying, the goods are to be kept well open by the broadsman, and the reel well turned from the time the cloth is entered, until it is taken out; for if this be neglected, the colour will ever be liable to be spotted and uneven. Immediately after the cloth is entered, the fire is to be made up, the furnace-door shut, and the liquor made to boil as quick as possible. This is understood to be the first saddening, and the boiling must not be so strong as in the first process. When the cloth has been in two hours, and has boiled gently at least one hour out of the two, take it out, having previously cooled the liquor down with water; air the cloth as before, until nearly cold, and bring the furnace to boil, as directed for the last saddening. The material to be added at this time is only nine ounces of copperas, which has to be proceeded with as before, with this difference, that when the saddening has been continued one hour, a pattern is taken off the lacing and scoured, when the colour is matched with a good black pattern. If the colour is not full enough, the saddening must be continued longer. If the colour is wanted of a green hue, add about an ounce of verdigris in the last saddening. If the body of the colour is too strong, lessen the quantity of copperas, and if too weak after going its time of two hours, add more. In matching of colours, it must be understood, that both patterns must be either dry or wet, or there will be many shades of difference in the colour, though they might appear to match before.

This recipe would produce a better blue-black by not boiling between the first and second, and the second and third process; but if verdigris is added in the saddenings, the liquor will have to boil before heaving in the cloth. When verdigris is intended to be used, it should be weighed off and put in soak in boiling water, a day or two before it is wanted.

The workmanship, which I have described for blacking with this recipe, must be observed for all others.

Many dyers who come from England and other countries, who understand but little of black dying, will prescribe a much greater portion of ingredients to produce the colour on the same quantity of goods; but this must result from ignorance, it having been proved, that too great a body of colouring matter injures a black, by making the shade brown, russetty, and too heavy. To produce a perfect colour, the copperas and colouring matter require to be used in given proportions, I have before given the proportions of copperas necessary to saturate logwood, sumach, and nutgalls.

When a blacking is finished, the cloth should be about half cooled, then separated into pieces, and each one folded up and placed across a wooden horse, where it should lie until the following morning to drain, cool, and give time for the iron to oxydize to its maximum, before it is washed; for if cleansed immediately after it comes from the dye, the colour will not be so good as when it has laid twelve or sixteen hours. The sun should not be permitted to shine on the cloth for any length of time between the dying and washing. If there be no shed to put it under, it should be covered with sheets made from bagging.

I have divided this colour into blue, yellow, and jet blacks, and there are innumerable shades of each. To produce these at the will of the workman, can only be acquired by long practice. I shall give recipes for each of these, and the dyer who has a knowledge of the business, can vary the body and hue at his pleasure.

Another black for twenty pounds of woollen.

Six pounds of logwood, one and a half pounds of sumach, twelve ounces of fustic, and three ounces of pearlash.

The wares to boil two hours, run up, stir well, throw in the cloth, and boil it three hours. Let the furnace now be run up, the cloth taken out and cooled; then add the following ingredients to the liquor; only dissolving them previously in a bucket without boiling: three pounds of copperas, and two and a half ounces of blue vitriol.

When the cloth has been cooled, stir the liquor well, throw in the cloth, and boil gently for four hours; then run up, heave out, throw it until half cold, and proceed as directed for the last blacking when finished.

Another recipe for a blue-black, in which dye-woods are used in the saddenings, for sixteen pounds of woollen cloth.

Four pounds of logwood, one and a half pounds of sumach, and five ounces of pearlash.

Let the wares boil two hours, heave in the cloth, and boil two hours and a half; then proceed as before.

For the first saddening, use one and a half pounds of copperas, one and a quarter pounds of ground logwood, and ten ounces of blue vitriol. Boil two hours, and proceed as usual.

For the second saddening, add one and a half pounds of copperas, and six ounces of fustic.

Boil one hour, and try a pattern; if not black enough, continue boiling another hour. The liquor must be boiled with the ingredients in both of these saddenings, for twenty minutes before the cloth is put into the furnace. It is necessary in all cases where colouring matter is added to the liquor in the saddenings, that they should be boiled from twenty to thirty minutes before the cloth is entered, or the colour will be uneven.

To dye sixteen pounds a yellow-black, approaching towards a jet.

For the boiling, use five pounds of logwood, eighteen ounces of sumach, fifteen ounces of fustic, and one ounce of pearlash.

The wares must boil two hours, the cloth two and a half, cool down the liquor, and heave out and cool the cloth.

For the first saddening, use one and a half pounds of copperas, and four and a half ounces of blue vitriol.

The ingredients to be dissolved and added without boiling the liquor, and the cloth to boil two hours, then heave out, &c. as before.

For the second saddening, add one pound and three quarters of copperas, and five ounces of fustic.

The ingredients to be boiled twenty minutes, then throw in the cloth and boil one hour and a half, heave out, cool, &c.

For the third saddening, use eight ounces of copperas, and twelve ounces of fustic.

The wares to be boiled twenty minutes, and the cloth to run one hour and a half, boiling gently for half an hour of the time.

To dye sixteen pounds of a rich reddish brown black.

For the boiling, use six pounds of logwood, one and a quarter pounds of sumach, fourteen ounces of fustic, five ounces of argol, seven ounces of madder, and three ounces of verdigris.

Let the ingredients boil two hours, the cloth run two hours, and proceed as usual.

For the first saddening, use one and a half pounds of copperas, two and a half ounces of sumach, and two and a quarter ounces of fustic.

Boil the wares twenty minutes, heave in the cloth, and boil it two hours.

For the second and last saddening, use one and a half pounds of copperas, two and a quarter ounces of blue vitriol, two and a quarter ounces of sumach, and seven ounces of madder.

Boil the wares twenty minutes, heave in the cloth, and boil it gently until the colour is rich enough.

I have before remarked, that when dye-wares or verdigris are added in any of the saddenings, the liquor must always boil twenty or thirty minutes before the cloth is entered; but that when only copperas and blue vitriol are added, it may boil or not, at the option of the dyer. When put in without boiling, they must previously be dissolved in a bucket, particularly the blue vitriol, which is the most difficult of solution. Let me here remark, that in all cases before cloth is entered into the furnace, the liquor must be well stirred with the dye-house rake.

To dye sixteen pounds of cloth a jet black.

For the boiling, use six pounds of logwood, one pound and three quarters of sumach, and one pound and three quarters of fustic.

The wares to boil two hours, the cloth three, and heave out and cool.

For the saddening, use two pounds and three quarters of copperas, and three ounces of blue vitriol.

The ingredients to be dissolved in a bucket, and added to the liquor without boiling; the cloth to be boiled four hours, run up, hove out, and proceed as before directed.

The following recipe for a jet black answers better than any other I ever tried. The body is strong, the colour of a superior hue, and is so permanent that it will wear without changing as long as the stoutest cloth will last. I once sold the recipe in England, for this process, for three hundred pounds sterling.

For sixteen pounds of cloth.

Twelve ounces of argol, and six ounces of verdigris.

Dissolve the verdigris by putting it in a bucket of boiling water the day before using it. Bring the furnace to a boil, and boil the materials one hour. Heave in the cloth, and boil it two hours, then heave it out, fold it up, and let it lay twelve hours or more, not exceeding two days. It is then to be washed at the fulling-mill, and a fresh liquor made for colouring it.

To colour to advantage with this recipe, there should be two kettles employed, one for the above preparation liquor, and a second for finishing; for after one lot has been boiled, if others follow it in the same liquor, one-sixth of the above proportion of ingredients may be saved, and the liquor will not injure by being kept for months, provided it does not lay too long in a cold state. Where this convenience cannot be obtained, three or four boilings may be made, one after the other, on the same day, as the prepared cloth will keep any reasonable time after being washed.

When the cloth has been prepared, as above stated, it has to be boiled in a new liquor, as follows: six pounds of logwood, two pounds and a half of sumach, one-quarter of a pound of fustic, and seven pounds of white-oak sawdust.

Let the wares be boiled two hours, the cloth thrown in, and boiled three hours.

For the first saddening, use one pound and three-quarters of copperas.

Dissolve and put in the copperas, heave in the cloth, and boil two hours.

For the second saddening, use one pound and a quarter of copperas.

Dissolve the copperas, heave in the cloth, and boil one hour and a half. Should any of the colours be too strong in body, use a smaller quantity of logwood, or the same quantity and less copperas.

In this country, where the swamp-maple bark is so easily obtained, I would recommend it to be used in place of the sumach and white-oak sawdust. If six pounds were used with the logwood and fustic in the boiling, I have no doubt it would make even a better colour than the above recipe.

For dying a rich red-black, take any of the recipes, excepting those for blue-blacks, leave out the fustic, and add in place of it, two pounds of ground barwood, and one o. alder bark, for every twenty-six pounds of cloth, dividing these between the two saddenings.

After blacking, and the cloth has lain on the horse about fourteen hours, let it be first streamed, or washed well in a mill, and then scoured clean with fullers-earth, according to the directions given for scouring of cloth.

After blacks are scoured, should any of them be too brown, or have a russet hue, they may easily be remedied as follows: bring a furnace of clear water to a blood-heat, and add to it as much oil of vitriol as will give to the water a pretty sour taste, then run the blacks in it, until they become of the hue wanted, without raising the temperature of the liquor. By this simple process, all brown-blacks may be improved, and the cloth will handle the softer for it; but it must be a bad dyer whose colours require it.

When an English dyer is desirous of having a black unusually rich and full bodied, he prepares the material at the season when walnuts are ripe. He purchases the green hulls from those who grow the nut, and puts them into large hogsheads, filling them with water so as to cover the hulls. It must be understood that these hulls, if left in a heap only a few days after they are taken from the nut, will be spoiled for this purpose, and that when in the casks, they must always be kept covered with water, for if permitted to lie on the top uncovered, they will soon be injured. The dyer uses them after a black has been coloured, when it has been washed clean in the stocks, but before scouring with earth. For enriching eight ends, or two hundred and twenty pounds of black cloth, put into a furnace of clean water from eight to sixteen gallons of the hulls, with the proper portion of their liquor, add to these four pounds of alder bark, boil them two hours, cool down with water, and rake the hulls and bark out of the liquor. When this has been done, enter the cloth, and run it without additional heat until it is of the desired colour. This will add very much to the body and permanency of the black, and will make the goods handle soft. The hulls of the common walnut would probably answer every purpose.

It is a fact not generally known, that any colouring matter put on in this way, after a black has received its colour, will increase the body of the colour much more than when the same material has been added in the first process, and in most instances will appear much blacker. Weld and argol, or weld and verdigris, make an excellent liquor, for improving the colour of blacks, giving a fine satin hue.

To dye wool black.

The tools used to work wool are, a rake and a stang. The rake has a wooden handle, long enough for the workman using it to stand on one side of the furnace, and to throw it to the side opposite to him, without stooping over the furnace: the handle is made somewhat stouter than those used by hay-makers. For the purpose of raking, iron prongs are placed in at one end, dropping down from the end of the handle about nine inches, and spreading at the points about five or six inches. An iron ring is put on the handle, where the shaft of the prong enters, to prevent the wood from splitting. A stang is a round and smooth wooden lever, about three inches in diameter, when intended for a large furnace, and long enough to reach to the bottom of the furnace, and to extend above the top from four to five feet.

The following recipe is for a black, where the wool is dyed a middling blue in the woad vat, and is for sixteen pounds of wool. When blacks have been previously dyed blue, the colours will never change in wearing.

Dye the wool in the vat to the blue wanted, wash it well, and then boil the dye-wares in the furnace in bags. The bags used for this purpose are very open in the texture, and coarse, but strong, and they should be made to hold double the quantity of the dye-wares intended for one operation, for when a bag is crowded, the liquor cannot penetrate to the centre so as to extract all the colouring matter contained in them. When the furnaces are large, and great quantities are intended to be coloured at each operation, at least four such bags should be provided for each furnace.

Recipe for sixteen pounds of black wool.

Eleven pounds of logwood, three pounds of swamp-maple, and two pounds and a half of fustic.

Boil these in bags for four hours, take out the bags, run up the furnace with cold water, and heave in the wool; handle it well for half an hour, and boil it well for three hours.

It will be necessary to explain what is meant by handling of wool in the furnace. I have before described the rake and stang, the tools with which the operation is performed. The wool must in all cases be completely scoured, and well washed before it is coloured, and it is essential to have it in a moist state before entering the furnace. Before the wool is put in, the liquor must be cooled with cold water to about 170° Fahrenheit, then stir it well with a dye-house rake, and throw in the wool. While one person is throwing in, another is employed to push it under the liquor with a stick; when the whole is in and under the liquor, take the rake and draw the wool from that side of the furnace opposite to the workman, to that where he stands, then thrust the long lever or stang down to the bottom of the furnace, on the same side the man stands, forcing the wool down with it. When the stang strikes the bottom, thrust it toward the opposite side, along the bottom, and bring up all the wool to the surface. Let the stang be now drawn toward the workman, one or two feet, according to the size of the furnace, the curb of which acts as a fulcrum to the lever, and with the weight of the body suspended on the end out of the furnace, lift the wool above the liquor, and by a jerk and a twist of the stang shake the wool abroad on the surface. Let it now be raked over again, and proceed as before. These directions must be kept in view, and the operations pursued in every instance where wool is to be dyed in the furnace, for, if neglected, the colour will be uneven.

It will be seen that half an hour is prescribed for working the wool after it has been thrown into the liquor—by the time this has been performed, the liquor will begin to boil, and must be kept boiling slowly all the time prescribed without any further handling. The same process will have to be pursued for all wool colours that are dyed in the furnace, therefore, I need not repeat these directions for any recipe that may hereafter be given, only mentioning the time of boiling, handling, &c.

When the wool has boiled the time prescribed, it has to be saddened with the following materials: one pound and a quarter of copperas, and eleven ounces of alum.

Handle well for half an hour, then boil one hour, and let lie all night.

The ingredients used in the saddening must be dissolved in a bucket of the liquor before the time of using them, and the liquor in the furnace cooled down with water as low as convenient, before any of the saddening compound is added. When this has been done, one person should be actively employed in handling the wool, while another sprinkles the saddening liquor over the surface of the liquor in the furnace, in small quantities at a time, permitting one quantity to be mixed thoroughly with the wool before another is added, administering it at regular progressive periods, till the whole of the saddening solution has been added, then continue to handle afterward for the space of ten or fifteen minutes.

Recipe for colouring sixteen pounds of wool for a black mixture.

This proves a very good colour, and is tolerably permanent. It must be understood that the quantity of dye-wares prescribed are always for clean wool, as an English dyer never attempts to colour it in any other state.

Seven pounds of logwood, ten ounces of blue vitriol, and seven ounces of verdigris.

Proceed as directed before in the boiling of wares and wool, boil the wool three hours, and let lie all night.

Recipe for sixteen pounds of wool for a black mixture.

Seven pounds of logwood, fourteen ounces of alder bark, six ounces of fustic, and one ounce and a half of pearlash.

Boil the wares in bags four hours, take the bags out, run up the liquor, heave in the wool, handle forty minutes, boil three hours, and then stew over.

One pound and a quarter of copperas, and seven ounces of blue vitriol.

Handle until the colour is even, boil one hour, and let lie in all night.

To dye black on cotton.

I shall proceed to give three Manchester recipes for dying black on cotton. They were obtained from a first-rate Manchester dyer. After which I shall give a new mode of dying cotton recently discovered.

First Manchester recipe.

The cotton has first to be dyed a light blue, in the usual blue vat, and then washed. For each pound of cotton to be dyed, boil four ounces of sumach, and a double handful of logwood chips, which have been boiled before for other colours; when these are boiled, take the clear liquor and add to it half a pint of urine, turn in the cotton, handle well, and let it lie all night. Take it out in the morning, dissolve for each pound of cotton half an ounce of copperas, turn the cotton into this liquor, and work it well for ten minutes, repeating the same ten or twelve times, wring out and wash well—put another half pint of urine into the sumach and logwood liquor, turn the cotton again in this, for fifteen or twenty minutes, handling it now and then—dissolve another half ounce of copperas, and add it to the former copperas liquor, turn in the cotton, and repeat as before, wring out and wash well. Boil for every pound of cotton, twelve ounces of logwood chips for half an hour, take off the clear liquor, and add half a pint of urine for each pound of logwood; turn in the cotton for half an hour at the usual heat, work it well, raise it out, and leave it to drain upon a pin; dissolve for each pound of cotton, twelve ounces of copperas, put it into the logwood liquor, stir well, and turn in the cotton for half an hour, work it well, wring out and wash well. Boil the first sumach and logwood liquor again for half an hour, put in a handful of ground black-oak bark for each pound of cotton, and turn it in at the usual heat—dissolve for each pound of cotton two ounces of copperas, pour it into the last liquor, stir well, and turn in the cotton for twenty minutes—wring out, wash dry, and it is finished.

Second recipe for dying black on cotton.

Before giving this recipe, it will be necessary to give directions how to prepare the acetate of iron and the pyroligneate, to which I shall add the pyroligneate of copper, as each of these compounds will be prescribed in dying the different colours on cotton and silk.

To make a superior pyroligneate of iron.

Dissolve four pounds of copperas in twenty pounds, or as many pints of rain-water, and filter it—then dissolve four pounds of potash in twelve pounds of rain-water, and filter this also on another filter, mix the two liquids together, expose the mixture to the air, and when by the exposure it has attained a deep red colour, then pour the whole on a linen filter; when the water has passed through, there will remain on the filter a red oxyde of iron, which must be washed with much water until it has no taste of salt. This washing is done on the filter, and when completed, place the red oxyde of iron on a clean board until it is dry, and has attained its maximum of oxydizement; then take the oxyde and triturate, or rub it in a marble mortar, pour on as much pyroligneous acid as will dissolve it and filter again,

To make pyroligneate of copper.

Take one pound of blue vitriol, dissolve it in six pounds of rain-water, then dissolve one pound of pearlash in three pounds of rain-water, mix the two, put it on the filter, wash it, and dissolve in the pyroligneous acid, as directed for the oxyde of iron. When the pyrolignate of iron and copper are wanted in combination, take three parts of the oxyde of iron as it remains on the filter, after it is dry, and one of the oxyde of copper in the same state; triturate them in a marble mortar, pour on as much pyroligneous acid as will dissolve them, and filter the whole. These mordants are much used, either separately or combined, for dying fine colours on silk and cotton. For common colours cheaper solutions are made, by merely saturating pyroligneous acid with iron, either in a cold state, or by boiling.

The pyroligneous acid, as the term denotes, is an acid extracted from wood by distillation. The purest acid of this kind is very expensive, there being much trouble and expense incurred in separating all the empyreumatic oil from it; but that which is commonly used for the purpose of dying, need not be very pure—all that is necessary is to have it so clean from the oil that none of it shall adhere to the goods. The crude acid can be bought by the cask at eight cents per gallon.

For making common pyrolignate of iron, the acid is put into large casks, vats, or any other vessels, to which is added old iron hoops, the dust which falls from the stones in grinding edge-tools, or turnings of iron, and the liquor left to stand open until strong enough. It should be frequently stirred, and occasionally drawn off and thrown on again.

The pyroligneous acid, in its crude state, as it is collected from the still, will dissolve double the quantity of iron that will be taken into solution by strong vinegar.

The common acetite of iron is made by putting strong vinegar into a vessel, and adding iron the same as before. In many dye-houses in England, they keep this liquor in large quantities, and value it according to its age. For some purposes they add alder bark, &c. to these liquors.

We now proceed to the second recipe for dying of black on cotton.

Dip the cotton in four quarts of the common acetite of iron, or in two of the pyroligneate made by a cold solution, to each pound of cotton, let it lie all night, in the morning wring it out and dry, and afterward wash it well. Boil in a copper vessel four ounces of sumach, eight ounces of umbro madder, and two ounces of logwood, for each pound of cotton; boil the sumach and logwood together for one hour, and empty the clear liquor into another furnace; into this liquor put the madder, and drive on the fire until it just boils; then draw the fire, and when the liquor is milk-warm enter the cotton as in the blue vat, bring the liquor to a boiling heat in one hour and a half, but not to boil out; let it lie at that heat for fifteen minutes, then draw the fire, place the cotton hollow and straight, and let it lay so for one or two hours, then raise it out of the liquor and wring gently, shaking the madder well out of it—take it out one string at a time, wash clean from the madder, wring evenly and dry. In the summer, dry in the shade, and in the winter in a stove.

The third recipe for cotton is much cheaper, but not so permanent, nor does it make so fine a colour as the others.

Boil a sufficient quantity of sumach for half an hour, strain the liquor, into which enter the cotton, and work well for half an hour, wring out, dip it in water and urine, and then rinse it; dissolve copperas in water, into which enter the goods, and handle them rapidly for half an hour, then wring them out, and enter them into pure lime-water. Boil logwood in water for one hour, and strain it through a cloth; enter the cotton in this, and work until it is of the colour wanted. It must then be exposed to the air to dry. If dark enough, wash it, and redry it; if not dark enough, give it another dip through the same materials. Cotton, which will not take up more than a given quantity of colouring matter at one operation, will, after dying, take up a second portion; and whenever a strong rich colour is wanted on cotton, it is better to give it one portion, then dry and wash, when it will take a second very rapidly. By repeating the operations, any body of colour may be obtained.

A new method of colouring black, discovered by Messrs. William Adams & Co.

Pad the cotton in such pyrolignente of iron as is made by the firm abovenamed; then dry the cotton, run it through water containing chloride of lime, about two pounds to the hogshead of water, dry again, and then finish in a logwood liquor, or with logwood and madder, or logwood and sumach.

To prepare the chlorine water for black.

Stir two pounds of chloride of lime in four gallons of water, let stand to settle, and then pour the clear liquor into a hogshead of water. This is the most expeditious mode of dying black on cotton, and the colours are superior to the common productions.

To dye black on silk.

Take any quantity of valonia, boil it in a copper furnace, strain the liquor into a back of such heat as will not interfere with the resin of the silk—put the silk into this liquor for three days, turning it once a day, wash out, and stick up to drain. Bring on a kettleful of clean water to a boiling heat, put into it a great quantity of copperas, with a small quantity of logwood, and alder-bark liquor; give the silk four wets in this, boiling hot, wring out over the kettle, hang up in a stove and dry. It may be scrooped with lime-juice; should it feel harsh, beat it well with fullers-earth on a smooth stone, then wash it clean, wring as dry as possible, and hang it in a stove to dry.

The silk dyed by this recipe was the raw article in skeins, which always contains a considerable portion of natural resin that must not be disturbed by the heat of the liquor: hence the reason of the precaution used in the recipe. It will be understood, that when gum is mentioned in any other recipe, it has reference to this explanation.

Valonia is the cups and stalks on which the acorns grow of some peculiar oak; it is imported largely into England, for the purpose of silk dying, and for tanning some kinds of leather.

The alder-bark liquor, mentioned in the last recipe for dying, is made as follows: take any quantity of pyroligneous acid, fill casks with it of one hundred gallons, each two-thirds full, into each of which put two baskets full, or two bushels of chipped alder-bark, and a large quantity of old iron hoops, turnings of iron, or the dust of iron that falls off in grinding edge-tools; the latter is mixed with the powder from the stone, which will by no means injure the compound.

Many of the colours in silk dying are scrooped with lime-juice, which is done after the goods have been dyed. To do this, some lime-juice is put into a tub of clean water, the coloured silk is immersed in it, and a few turns given, when it is wrung out and dried. This is done for the purpose of making the colours clear and bright, and in black for taking off any russet hue that may have been left by the colouring. A weak oil of vitriol liquor is supposed to answer nearly as well. These remarks will be kept in view whenever scrooping is mentioned in other recipes.

The following recipes for dying black on silk, are extracted from a work published at the expense of the government, dated the 7th of February, 1828; being a treatise on the manufacture of silk, edited by Dr. Mease, of Philadelphia. I shall insert such recipes from this work, on other colours, as I think may be useful.

Process of dying silk black, by Vitalis.

Boil the silk in the ordinary way, with twenty pounds of soap to one hundred pounds of silk, and after it is well washed, and freed from the soap, it is dried. The skeins are then immersed in a decoction of galls in sorts, in the proportion of two ounces to a pound of silk. The gall bath must be moderately warm. The hanks are put on the rods, and lightly pressed. They are then put into the bath, which must be kept warm during fifteen or eighteen hours; after this, they are to be taken out and dried, and then put into a warm bath of pyrolignente of iron, of the strength of 5°, as marked on Baume's hydrometer, and dipped for some time; then immersed, and the heat of the bath increased, during five or six hours, taking out and airing them from time to time. After being taken from the iron bath, the silk is wrung and dried in the air, or under a shed in moist weather. It then receives two beatings, and is subject to a new galling, made with the remains of the former gall liquor, and an ounce and a half of galls to a pound of silk: then taken out, wrung and dried. This galling is followed by a new bath, made warm, of the pyroligneate of iron, of four degrees of strength, with the precautions before noted. The silk is again taken out, wrung and dried, two more beatings and a third galling given to it, the bath of which must have one ounce and a half of new galls to a pound of silk, and the former procedure renewed. It must then have another bath of pyroligneate of iron, of three degrees of strength, and be dried and washed. For deep black, a fourth galling with one ounce of galls to a pound of silk, followed by the pyroligneate bath of 3°, will be requisite; then dry and wash carefully. Run it through a warm bath of soap and water, into which plunge it for some time; after which it is to be washed and dried for the last time. It may be gummed if required.

Chaptal says, "a very full, clear, permanent black, has been obtained by the employment of a solution of iron immediately after a strong galling; the stuff is then immersed in a decoction of logwood, and next into this decoction conjoined with a solution of iron and verdigris: and this process is to be repeated until the black is very beautiful. With this view, one hundred and ten pounds, five ounces, and ten drachms of silk; forty-four pounds and two ounces of nutgalls; sixty-six pounds and three ounces of copperas, calcined to redness—the same quantity of logwood, and eleven pounds, nine drachms of verdigris, were employed."

The silk is to be first wrung out of the galls, allowed to dry, and then strongly shaken by the hands, in order to ventilate, and detach from it any adhering galls.

The same process of rubbing, shaking, &c. is to be employed in respect to the logwood bath; and the silk is to be carefully washed after each immersion in the solution of copperas. In the last logwood bath is to be dissolved two ounces and fifteen drachms of gum arabic, to one pound, four ounces, and four drachms of silk; the black is softened by passing the dyed silk through soap and water.

To dye furs or hats black.

Prepare them first in a liquor, in which has been dissolved one pound of argol, and about ten ounces of verdigris, for every twenty pounds of fur, or hats; then finish the hats with swamp-maple bark, logwood and copperas, and the furs with the usual dye-stuffs.

On blue dying.

I shall begin with the woad vat. It may be useful to the dyer to know how to measure the contents in gallons of a vat, or any other conical or cylindrical vessel; for it will be perceived, in the course of the following instructions, that the quantity of material used, must always be nearly in a given ratio to the contents of the vessel employed.

When a vat is cylindrical, that is, when the diameter of the whole length, from top to bottom, is the same, multiply the diameter in inches by itself, and cut off the right-hand figure, and the remaining figures express the ale gallons in a yard length of that cylinder, near enough for every practical purpose, it giving only one gallon too little in three hundred and seventy-nine. When a conical vessel has to be measured, that is, a vessel that is larger at one end than the other, and regularly widening from the smallest end to the largest, take the mean diameter, reduce that to inches, and proceed as described for the cylindrical vessel.

A vat for woollen dying may be of any dimensions that may suit the whim or convenience of the dyer. The English vats that have come under my notice, have been of one size: seven feet six inches in depth, the same in diameter across the bottom, and six feet across the top. This shape is considered advantageous, because the bottom being large, will hold the sediment without rising so high as to interfere with the work, and because the sediment settles without lodging against the sides of the vat, which of course would be taken up by the wool or cloth dyed in it.

White-pine planks, free from knots, two inches and a half thick, are used for making blue vats, and they are bound with stout iron hoops, about three inches wide, driven on very tight, the lower one over the chime, and a second about six inches above it; three others, making five in all, the last one near the top, are all that is necessary to make it very secure. When the vat is put in its place, a puddle of strong, stiff clay, should be placed under the bottom, on, and into which the vat is worked, until the space is quite filled up between the bottom of the staves and the bottom of the vat. To accomplish this, two or three holes are bored through the bottom, to give vent to the air underneath, which would otherwise prevent the vat from sinking in the puddle.

There are three different ways of heating the vat liquors. One by turning it over into a furnace, and when heated to boiling, returning it again into the vat; a second by having a part of the vat made of metal, and passing a flue round it; and thirdly, heating it by steam. I shall describe each of these operations, that those who are interested may make choice of the one that suits them.

When a vat liquor is bailed into another vessel to be heated, a furnace must be placed within a convenient distance, large enough to hold rather more than two-thirds of the liquor, without being quite full. Wide gutters must be provided, long enough to reach from the centre of the vat to the centre of the furnace. A piggin holding about two gallons, suspended on the end of a long pole, will be wanted to lade the liquor backwards and forwards. A vat kept in constant work with wool, will have to be heated twice a week—on Wednesdays and Saturdays. The liquor should be thrown over in the morning, after settling all night, before stirring, for if this be done an hour or two after stirring, there will be sufficient woad, and other contents of the vat floating in it, to burn against the side and bottom of the copper; and as indigo is always mixed with the sediment, some of this also will be burnt. When a liquor is in the furnace, the fire should be driven on rapidly, until it approaches to a boiling heat, and then lowered to prevent its boiling over, which it is apt to do, as rapidly as new milk. A vat liquor, when strong in material, will boil at about 204° Fahrenheit, when weak at 208°. When near boiling, the head, on being separated by a board, will close together again instantly. Two buckets full of water should be standing by the furnace, ready to throw in when the head begins to rise from boiling, the furnace-door should be thrown open, and the fire raked out. After standing a few minutes, the liquor has to be thrown back again into the vat.

When a blue liquor is intended to be heated by fire, without boiling it in the furnace, the vat must be differently constructed. A conical vessel must be first made, six feet deep, seven feet in diameter on the bottom, and six feet across the top. This vessel is to be cut off two feet from the top, and a sheet of copper nailed on the lower edge of the upper piece, and on the edge of the lower piece. The sheet copper must be fastened on the inside, first working round the staves with a circular plane, three inches from each end, and inserting two strips of canvass, well coated with white lead, between the wood-work and copper, on, and to which, the latter should be fastened with copper nails, driven in so close together that the heads come nearly in contact, but not so as to lap over each other. A fireplace is fixed in any part of the circle that is most convenient, with a grate, door-frame, &c., and is placed five or six inches lower than the copper round the vat. A brick flue is built round the copper, which commences where the fire enters, and continues to the other extreme of the circle, where the smoke enters a chimney, and is conveyed off. The flue round a vat should be ten inches at the bottom, and three at the top, narrowing upwards, in order to facilitate the closing of it. There should be two thicknesses of brick between the flue and each edge of the wood-work, to prevent the fire charring the vat at either edge.

When a vat is heated by steam, it is cut off as in the former case; but instead of a sheet of copper between the wood-work, a cylinder of iron is used, three feet six inches deep, and of the same diameter as the wood-work: it is cast with two flanges of seven inches, one near the top, and the other near the bottom of the cylinder. The principal use of the flanges is to insert a circle of stout staves between the two, so as to secure a free passage for the steam around the work and iron cylinder. Into this passage the steam is admitted from a boiler, and the condensed water passes off by means of a syphon, at any part of the circle, where it may be most convenient to place it.

An English vat, of the size described, is set with five hundred and sixty pounds of the best woad, five pounds of umbro madder, one peck of bran, four pounds of copperas, and a quarter of a peck of dry-slacked lime. Before we proceed, it will be necessary to give directions for preparing the lime.

For two English vats, a half-barrel of lime should be prepared at one time. Take new burnt lime, put it on a clean stone floor, and pour sufficient water over it from a watering-pot, to make it fall into a fine dry powder, but not enough to leave the mass wet when fallen. When watered enough, put it up into a close heap; throw a wool bag over it, and leave it until the following morning. The heap has then to be opened, and the stones, if any, taken out of it. It must now be put into a box having a close lid, and left for use. Care must be taken to have the box, in which the lime is placed, as air-tight as possible.

The woad will have to be chopped into small lumps with a spade, and thrown into the vat before the liquor is put in; let the madder be broken into the vat in small pieces, and the bran and lime thrown in upon them. When the materials are in the vat, it should be filled up with water that has been boiled and cooled down to about 195° Fahrenheit, from the furnace, and the contents kept stirred all the time it is filling. When the vat is full, within four or five inches of the top, give it a good stirring for half an hour, and then cover down close. A dye-house bucket should hold four gallons, and whilst the vat is stirring after it has been filled, put in one bucket of well-ground indigo, containing fifteen pounds of the dry article. The vat should be set about four or five o'clock in the afternoon, and be attended and stirred about nine o'clock the same evening; by this time, if every thing goes on regular, the fermentation will so far have progressed, that, when a small portion of the liquor is let run from either a scoop, or any tin vessel, between the person viewing it and the light, it will appear of a dark bottle-green. When well stirred, let it be covered down, and if the weather should be cold, throw some mats or wool-bags over the covers to keep in the heat, which will prevent its cooling too low before the liquor comes to work. The person who manages the vat, must attend at five o'clock the following morning; let him take off both covers, and plunge the rake into the vat, so as to bring up some of the air to the surface that will be carried down by the rake, when a part of the sediment of the vat will rise with the bubbles. If the fermentation has progressed, as it should do, the air-bubbles will appear of a fine blue, and a number of copper-coloured scales will float on the surface of the liquor. Should these appearances take place, and the liquor, when viewed by transmitted light, be of a dark olive-green, put into it another bucket of ground indigo, and a quarter of a peck of the slacked lime; stir the liquor for twenty minutes, and cover down close. The heat of the vat should now be at about 140° Fahrenheit, and if it has lowered down below 135°, and it be a fire vat, a fire must be applied to raise and keep it at the latter heat. Two hours after this stirring it must be stirred again, when, if the fermentation is found to have gone on in regular progression, the liquor will be of a brighter olive than in the morning, the bubbles will be of a richer purple, and the surface more generally covered with copper-coloured scales; should these symptoms make their appearance, add another quarter of a peck of lime, stir for ten minutes, and cover down close as before. The liquor must now be stirred every two hours, and if the appearance continue to improve, a quarter of a peck of lime will have to be added at each stirring, until there have been given from eight to ten quarters, including the one that was put in when the vat was first set. By the time eight have been added, the liquor will look very rich in the head, the bubbles will rise of all sizes, from the bulk of an hen's egg to that of a small hazel-nut, and none of them will break so as to disappear; but many of them will collapse, and as they fall together, will appear of a rich smalt colour, coated with a fat-looking skin. A large quantity of bubbles will have risen by this time, which, laying on the surface in a compact mass, will look rich, and the greater part will have passed from a blue to a copper colour. The indigo, when raked up, will show in the liquor in clouds; its appearance will be a rich yellow-olive, clouded with indigo. When the vat assumes all these appearances, it is said to be in fine condition, and every thing will have gone on in regular order; but as it often happens, that a vat does not come on in the regular way, the vatman must be attentive to appearances, when he stirs the first morning after setting. If the bubbles and head are at that time weak and watery, and the liquor shows no copper scales on the surface, and appears of the same colour as when stirred the evening before, something must be added to accelerate the fermentation, and it is usual to add bran and madder. It will seldom happen that a vat is delayed in coming to work, unless the fermentative quality of the woad has been injured in making. This, however, is not the only cause that may occur to check the fermentation, although it may be the most prominent one. The fermentation may be delayed by an inexperienced workman, by either scalding the woad, by pouring on the water too hot when set; by having the water too cold when set; or by permitting it to cool too rapidly after setting. These errors ought never to be committed by an experienced workman.

I have directed that from eight to ten quarter-pecks of dry-slacked lime be used, when a vat is set with five hundred pounds of woad; but as the quantity required, will altogether depend on the strength of the woad, as well as on that of the lime, there can be no absolute rule given. I have found, however, that the Rhode-Island, Dexter lime, is of equal strength with the English Cromwell, being that which is used for this purpose in the west of England; and I would recommend those who attempt the woad vat to use that lime, provided they should follow these directions.

There is probably no article more uncertain in its strength and quality than woad. The principal object to be attended to in the purchase of woad, is to procure it of the strongest kind, and to take care that the supply be uniformly of the same strength; for any considerable variation in this particular, will prove very disastrous to the operator, however skilful he may be in his profession, and will be altogether ruinous to a young beginner. Woad is often injured in the making, by being overfermented, and such woad will never work well. Sometimes the plant is not sufficiently fermented, in which case it ferments too freely in the vat, but this is an evil that may be cured, provided the workman has sufficient judgment to know how much it falls short of the due fermentation, and how to keep it in check.

A dyer, at all conversant with the woad vat, may, taking prime woad and following my instructions, bring it into good work, and produce colours equal to the English; but should they take woad at hazard, no certain rule can be given. I have seen at one dye-house in this country, four kinds of woad in different states of preparation. The workman was a European, and appeared to be very skilful in his profession; but he complained very justly, that his vats worked irregularly, owing to the great difference in the quality of the woad. The owners of factories may rest assured, that their woad dying will never equal the English, until they procure woad that shall be nearly equal in strength and condition.

When the vat has been brought to work, as before directed, a cross is suspended in it, on which the net will have to rest. About forty pounds of wool is dyed at once. The wool must be thoroughly cleansed from the grease and yolk, and well shaken on the floor close to the vat before it is entered. One man should strew it over the top of the liquor, and another put it under with a vat stick; when it is all in, it must be handled very briskly the whole time, when the vat is new and strong of indigo, or the colour will be uneven; when a liquor has been worked some time, and the strength of the vat lowered, the wool need not be handled more than one-third of the time. In a new strong liquor, such as I have given directions for setting, the wool should not be permitted to remain for more than half an hour, when it will have to be wrung out at three wringings, which should be performed as quick as possible, and wrung very dry. As soon as the workmen throw one lot out of the wringing cloth, another person should immediately shake it up, so that the air may have access to all parts of the wool, and then reshake it into a heap; as soon as the whole is out of the vat, let the heap be again shaken until the wool is nearly cold. It must be noticed that a woad vat should never be worked at more than 125°, and when new at no higher temperature than 115° Fahrenheit.

In dying with woad, there should always be two vats in operation at the same time; one that has been worked for one or two months, and a new vat. The wool to be coloured, should be primed in the new vat, and finished in the older one.

A vat that is set with five hundred pounds of strong woad, will require five hundred more during the working, and this, in all regular dying establishments where constant work is required, will colour for six months; in which time it will take about five hundred pounds of indigo. The workmanship, after the first setting, to be managed as follows: dip two or three wets, of forty pounds each, into the vat after it has been brought to work at night; after the last dip, stir well, and if the liquor is cooled below the proper standard, put the fire on and bring it up to 125°, not exceeding 130° Fahrenheit, stir again at nine in the evening, and put in two quarter-pecks of lime, striking measure. The day following, the same wets may be redipped, when they will be of a pretty full colour—bring the heat up as the night before, after stirring, and when the vat is stirred at nine o'clock, give it one quarter-peck of lime. The day following, the vat must be renewed. First bring the heat up to 155°, not above 165° Fahrenheit; when brought to the requisite heat, put in half a hundred of woad, chopped fine as before, half a peck of bran, four pounds of madder, and twelve pounds of indigo, well ground; stir well after these things are added, and again at nine o'clock in the evening. The next morning it should be yellow in the liquor, have a thick copper scum on the surface, and the bead of a fine purple and very rich. Stir again at five o'clock the following morning, which repeat at noon and again in the evening; at the last stirring, add two quarter-pecks of lime. It will now bear working and replenishing regularly. When constantly working, it will, so long as woad is added, require two quarter-pecks of lime after each replenishing, and from two to three during each period of working. The reheatings should be done in the after part of the day, and the liquor, if every thing goes on regular, will be fit to work in the morning of the second day afterward. It is usual, in all regular dye-houses, to reheat the vats on Saturdays in the afternoon, and again on Wednesdays. For the first ten reheatings, there is added at each, half a hundred of woad, which makes ten hundred for the whole of one liquor. Twelve pounds of indigo are also added for each of thirty-nine reheatings.

A woad vat is liable to be out of order from two causes: from the lime being added in too great or two small a quantity, and although the causes of these defects are directly opposite, yet the first symptoms of the two extremes bear so striking a similarity, that it requires considerable practical skill to judge from which of the two it arises, and herein consists the whole difficulty of the business. It is altogether a fermentative process, and there is but little doubt that the fermentation is of that kind which has been termed by modern chymists the panary. It is necessary to keep the fermentation of the vat always in one state, and this is regulated by quicklime. If too much lime is added, the fermentation will cease; the air-bubbles, instead of forming a rich purple bead, will look white, and burst with a hissing noise, and the liquor will feel slippery when rubbed between the fingers. Whenever a skilful workman perceives this coming on, he will stop work until the liquor is brought back to a healthful state. The safest way of doing this is, to put into a hempen bag of coarse texture, one or two pecks of bran, (according as the vat is more or less overlimed,) and add an iron weight of about fourteen pounds, to sink the bag. The bag being tied up, is put into the vat, and the covers taken off to let the liquor cool to about 110°; in two or three days, and sometimes sooner, if the vat is not much overlimed, the bag will rise to the top of the liquor, and give out a sour fetid smell. The liquor should now be examined, and if it has recovered its fine green colour, smells of the woad, and feels rough, the bag should be taken out and put on a plank over the vat, until it has drained so as not to drip. The vat should now be covered down, and the heat of the liquor raised to 140° Fahrenheit. Let it be well stirred as soon as the heat is up, and if it does not show the usual appearances of a good liquor, add to it two or three buckets of swill till it comes round. It will be necessary to watch it carefully as soon as it comes to a proper state of fermentation; for the means that have been used to force it, will continue to operate so powerfully that, unless the excess of fermentation be timely checked by giving it lime, the whole contents of the vat will be irrecoverably lost.

When a woad vat is out of order, for want of lime, the bubbles that rise will also be white, and will fall with a hissing noise as before, but the colour and feeling will be different. The colour, when overlimed, will be of a light dirty-looking yellow; when underlimed, of a bluish green, in the first stages of falling off; and instead of being smooth, will feel rough when rubbed between the fingers. When it goes off from this cause, as much lime should be added as will bring it back to a healthful state, and the liquor should be heated to 150° or 160° Fahrenheit. On adding the lime, put in a bucket of swill to revive the panary fermentation, which will have been injured by having gone too far. A vat, set with a full quantity of strong woad, will ever be liable to get out of order; but this will be mostly prevented by a skilful workman, provided he pays proper attention to the working of the liquor during the day, and gives it a critical inspection when stirred in the evening.

A vat of liquor that has been overlimed, even to a great excess, may be brought back to a healthful state by cooling it down, and putting in bran bags, if care be taken to stop the fermentation with lime when it comes too again; but when a vat is out of order, from not having been sufficiently supplied with lime, and this has been permitted, either from neglect or want of skill, to proceed to an extreme deficiency, the fermentation will come on so rapidly and in so sudden a manner, that in a few hours the bottom will swim on the top, and give out a strong fetid odour, a putrefactive fermentation having taken place. When this occurs, the contents of the vat are lost, and all attempts to revive it will be only incurring expense, without the least prospect of success. But such extreme cases can never occur where the workmen have had due practice, and are at all attentive to their business.

The vegetable ferments I have recommended to be used in a vat are, bran, cornell, madder, malt, and hops; but the materials that may be used, include all the ferments that are promotive of the panary fermentation, such as malt dust, distillers' swill, beer grounds, yeast, hay, and ground grain of all kinds. It is useless, however, for a dyer to use too many, and, in fact, cornell and madder will answer every purpose.

It may not be amiss to recapitulate what has been said, relative to the working of a woad vat, when every thing goes on in a regular way.

It is difficult to give directions by which a vat of this kind may be worked regularly, as any little variation in the strength of the woad, or of the lime, will prevent it. The judgment of the vat-man must, therefore, be exercised on all occasions, and lime and ferments added, according to the situation of the liquor. The nearest rule that can be given is the following:

A vat, as I have before stated, that is set with five hundred pounds of strong woad, will take ten quarter-pecks of lime; by the time it is brought to work, after working the first day, it will require two quarters; and after the second day's working, one quarter-peck. It has then to be renewed, by adding twelve pounds of indigo, fifty-six pounds of woad, three pounds of madder, and one gallon of wheat bran, the heat being brought up to 150° Fahrenheit, before the ingredients are added. The vat to be well stirred after the materials are put in, and again at nine o'clock the same evening, also, three or four times during the following day; at the last stirring, if the state of the vat should not require it sooner, add two quarter-pecks of lime, also two after the first day's working, and one after the second day's. These directions are to be followed during every renewal, so long as woad is added; but afterward, when only indigo and ferments are put in, one quarter-peck after renewing, one quarter the first night after working, and half a one the second night. When neither indigo nor woad is put in, that is, while the vat is working down, a still smaller quantity is requisite.

When cloth has been coloured in the woad vat, it is first to be well scoured with fullers-earth, and then to be boiled one hour, with one and a half pounds of cudbear for each end of twenty yards of broadcloth. .The liquor being cooled down, the cloth is to be wound upon the reel, and left to drain; the workmen then throw it on a handbarrow, and carry it to the vat, on which they lay the barrow; the cloth is lifted by the men into the liquor, one fold at a time, open and square, and a third person takes it in with two light sticks. In doing this, he must be careful not to let any air go down with the cloth. When the whole is taken in, it lies oh the cross at one side of the vat, and the person who took it in, works it from side to side with a pair of hawks during thirty or fifty minutes, according to the depth of the colour wanted, and the strength of the vat. The hawks are made of iron, with sockets, which are placed on wooden handles about eighteen inches long. At the end of the sockets are iron rowels about the size of a cent, and as thick; the rowels are notched, and with these the cloth is worked backwards and forwards. It is necessary to be very particular during the work, that no air be admitted under the cloth, for when this occurs it will have light-coloured spots on it. The hawker must have much practice to perform this work with perfect safety.

It often occurs in England, that cloth is dyed in the flannel before it is fulled. When this is done, it must be well scoured with fullers-earth. After it has been boiled, the lists being previously covered with webbing, it is worked in the vat after the same manner as other cloth. When it has been coloured dark enough, it is well washed, scoured again with fullers-earth, and the webbing taken off. It is now fitted for fulling. When fulled and cut to furnace, the colour is made up to pattern in the vat, without covering the lists with webbing. If yellow list has been used, its colour will be a lively green when finished, and it will require a good judge to distinguish the cloth from wool-dyed.

To dye Prussian-blue on woollens.

Prepare the cloth by passing it through lime-water, at a gentle boiling heat. Wash well, cuttle up, and let lie till wanted.

Prepare a fresh liquor, with one ounce of prussiate of potash to each pound of cloth. The same proportions may be used for yarns. Boil gently for ten minutes, wind up, and let drain on the reel.

Prepare a fresh liquor, using one ounce of nitrate of iron to each pound of cloth, or yarn. This will give about a half-blue, and if required darker, use more nitrate of iron. Wind up and let drain.

It has then to be run through a third liquor, in which has been dissolved one ounce and a half of what is called the mordant, to each pound of cloth, or yarn. This is to make the colour even, and to give a bright clear lustre. There should be at least one gallon of water to every ounce of mordant. The temperature of the liquor should not exceed two hundred degrees. Turn the cloth in this rapidly for ten minutes, wash well in clear water, and tenter as quick as possible.

To make the Mordant.

Take any quantity of oil of vitriol, and mix it with its weight of water. When the mixture becomes cool, add as much potash as it will take. This compound is called salenixen. To every twenty pounds of the above, add one pound of argol, and the same quantity of spirits of salt, diluted with half water. It would not be worth while for our dyers to make the salenixen, as it can be bought much cheaper than they can make it by a direct process.

This mordant operates more beneficially, if small portions of sulphate of zinc are added to it, as the colour will be deeper and richer.

The above recipe was received from England a few months since, but is evidently defective. I would recommend the nitrate of iron to be put on the goods before the prussiate of potash; and before running them through the prussiate liquor, that they be dipped in a solution of chloride of lime, using two pounds to seventy gallons of water. The remainder of the process may be continued as directed.

Recipes for dying blue in the furnace.

This is often done for very common purposes, but never on any thing like fine goods, unless intended for deception. The following is the best recipe I have known for dying blue in the furnace; it is intended for twenty-eight pounds of stuff. Use three pounds of alum, two pounds of cream of tartar, two pounds of muriate of tin, and two pounds and a half of logwood.

Boil the wares one hour; heave in the cloth, and boil it one hour. When this has been done, throw away two-thirds of the liquor, and fill up with water; bring the furnace to a boil, and put into it one pound and three-quarters of chymic; let the liquor boil after the chymic is in for fourteen minutes, cool down, enter the goods, and let them boil till of the colour wanted. This colour was of a beautiful dark blue, and stood exposure to the weather for more than a month, before any sensible change took place, but in another month some parts of it were changed.

A blue may be made with logwood, by previously boiling the woollens to be dyed in copperas and blue vitriol; but this is so wretched a colour, and so very fugitive, that it would be unworthy of a place in a work professing to give instructions for dying of cloth. The process may be found in almost all the works on small dying.

Recipe for colouring a full navy-blue, for mixing for satinett, or other coarse work. It is for eighty pounds of scoured wool.

For the boiling, use twelve pounds of alum, and three pounds and a half of argol. Boil these one hour, cool down, heave in the wool, and boil two hours and a half; let lie in all night. Prepare a fresh liquor, in which boil eighteen pounds of logwood, and five pounds of peachwood. Boil the wares two hours, then the goods two hours and a half, and let lie all night—wash and dry.

To dye blue on cotton.

The common indigo vat, for dying blue on cotton, is well known in this country. I shall give directions for setting this vat, and then give directions for dying Prussian-blue on cotton.

A vat of one hundred and twenty gallons is nearly filled with soft water, into which put four pounds of the best indigo, well ground; to each pound of indigo add two pounds of green copperas, and two pounds and a half of dry-slacked lime. Add the ingredients in succession, as they have been mentioned, stir them together for half an hour, and cover down; then stir frequently, and on the second or third day it will be fit for use. Some persons add a little potash, about half a pound to the quantity mentioned, but most dyers leave it out.

To dye blue on silk.

To prepare the silk for receiving the dye, take twenty pounds of silk, and boil it in a liquor with seven pounds of white soap, until the silk becomes white. Stick up, make a lather of warm soap liquor that is blued with indigo, give it a few turns in this, wring out, dry, and stick up. There should be three hanks on each string, and two strings are sufficient for one stick. It is now fit for dying, which must be done in the ash vat, to the pattern wanted.

To dye cotton and silk a Prussian-blue.

Steep the yarn or cloth in a tub filled two-thirds with water, put therein twenty pounds of the nitrate of iron, or in proportion to the shade of blue that is wanted, or the pounds of stuff to be dyed; try two waters to one of the liquor; if too strong a shade is produced, add more water, or the reverse, steep well therein, wring out, and dry; then have a tub of water, say to hold four gallons, put therein two pounds of prussiate of potash, which dissolve; add thereto a pound or so of oil of vitriol. Before running the goods through the prussiate of potash liquor, run them through a solution of chloride of lime, prepared as follows:—Stir two pounds of chloride of lime into four gallons of water, let stand to settle, and pour the clear liquor into one hogshead of water, through which run the goods; then run them through the prussiate liquor, when they will assume the blue shade, light or dark, as may be wanted; these shades, however, must be regulated by using more or less of the nitrate of iron.

The French writers recommend two-thirds of nitrate of iron, and one-third copperas, in preference to using all nitrate of iron.

After the colour has been obtained, it may be raised two or three shades, by running it through a weak solution of water, slightly impregnated with ammonia.

To dye silk a sapphire-blue.

Wash the silk out of the suds, after the boiling process, as described for the first blue on silk, pump a bath of cold spring-water, put into it a ladle of alum liquor, (being from four to five quarts,) prepare half a pint of sulphate of indigo, or what is usually called chymic, of which add to the water as much as may be wanted to produce the intended colour; and as the silk will be of the colour of the liquor, there will be no difficulty in the operation. Colours may be dyed in this way from a pale to a dark sky-blue.

To dye silk a mazarine-blue.

For this colour, the silk must be prepared by boiling it in black soap, wash out of the suds, and stick up. The colour has to be filled up with cudbear. Make a strong decoction of this by boiling it one hour, and strain the clear liquor through a sieve into a back. The silk has to be well worked in the cudbear liquor for a considerable time; wring out, head it off in seven or eight knots, and heave it into the blue vat till of the colour wanted. Wring out, wash well, run it through a strong soap lather, wring out, and dry.

To make soap-lees for producing the lather.

Take lumps of lime, that is strong and has been recently taken from the kiln, put a quantity into a large butt, pour on boiling water, stir well, and let it stand a week. Make use of this liquor to produce a lather, with soap that is used for finishing the silk; it must always be used cold. Whenever directions are given for using a lather, after silk is dyed, it always refers to that which is here mentioned.

Prussian-blue, by Mons. Raymond.

Previous to the year 1811, the silks dyed blue were dull; but, in that year, M. Raymond invented a method of giving silk a deep and brilliant colour, which is now generally adopted, and is known by his name. Process as follows:— When the silk has been cleansed, immerse it for a quarter of an hour in water containing about one-twentieth part of its weight of the sulphate of the peroxyde of iron, at the ordinary temperature, wash, and hold it for half an hour in a bath, nearly boiling, of soap and water; wash it again, and put it in a cold and very weak solution of prussiate of potash, soured by sulphuric acid, or by muriatic acid. As soon as it is immersed it becomes blue, and nothing more is wanting, than, in about a quarter of an hour, to wash and dry it.

A handsome Turkish-blue, for ten pounds of silk.

Take one pound and a quarter of alum, two ounces and a half of cochineal, half a pound of composition, three-quarters of an ounce of indigo, and three ounces of oil of vitriol.

The silk, after being boiled in soap and water, must be rinsed in running water, and then wrung and well beaten. This being done, it must be coloured to a handsome light-blue, in a cold or warm vat, then rinse it in running water, wring and dry it.

As soon as the silk has become properly dry, it must be moistened in warm water, wrung out, and laid by wet, for further use.

Dissolve in a kettle, with eight buckets of water, one and a quarter pounds of alum, pour the solution into a vat, steep the silk in it, and work it well therein for the space of an hour; take it out, wring, and lay it aside in its wet state, for further use.

Lastly, boil a kettle with eight buckets of water, and put into it two and a half ounces of cochineal; let it boil for about ten minutes; cool the liquor with a bucket of water, and add half a pound of the solution of tin, and three-quarters of an ounce of indigo, which has been previously dissolved in three ounces of oil of vitriol, and stir the whole well. Immerse the silk-coloured blue in this liquor, work it well therein until the liquor begins to boil, let it boil one hour, working the silk continually; it must then be taken out, rinsed, wrung, and dried.

If you desire the blue to incline more to a red, increase the quantity of cochineal; if the contrary, take less.

Best ultra-marine blue, for ten pounds of silk.

Take filings of copper, free from all alloy of other metals; it is best, therefore, to rasp or file them yourself, in order to obtain them pure. Put these into a glass vessel, pour spirits of salt sufficient to cover them twice as deep as the space they occupy, and let them stand for twenty-four hours, or as long as necessary for the spirits to attain a blue or deep green colour.

Then pour off the clear part of the coloured spirits of salt into another glass vessel, add fresh spirits of salt to the copper filings, and continue this process until the whole are dissolved, when nothing but the earthy and impure parts will remain.

Mix all these coloured solutions of copper, and add thereto as much spirits of ammonia as will be necessary to saturate the mixture.

Then moisten the silk in warm water, so that all parts are completely and equally soaked; then wring it, and steep it in the blue tincture prepared as above directed; work it therein until it has attained a handsome ultra-marine colour; then take it out, wring it well, rinse in a stream, and dry it in the shade.

With the liquor which remains, you may colour many other agreeable blue colours; but you must add, at every colouring, a small quantity of spirits of ammonia.

A dark blue for ten pounds of silk.

Take one ounce and a half of indigo, three-quarters of a pound of vitriol, one pound and a quarter of alum, four pounds of logwood, and one-quarter of a pound of alum.

The greatest attention and accuracy in the process of dying this colour is necessary.

Mix the oil of vitriol and indigo as usual, set it by for twenty-four hours, and then stir a little water in to revive the action. After this, prepare a kettle with eight buckets of water, put into it one pound and a quarter of alum, and dissolve it completely therein. This being done, pour the solution into a vat, steep the silk in the solution, and work it well therein for an hour; after which, take it out, wring, and lay it by wet, for further use.

Put eight buckets of water into a kettle, pour the solution of indigo into it, and mix it well; work the silk well in this liquor for the space of half an hour, then take it out, rinse it in running water, wring and lay it by wet, for further use. By this process, the silk will receive a handsome light blue colour.

To deepen this blue, or to change it to a dark blue, proceed in the following manner: boil a kettle with sixteen buckets of water, add four pounds of logwood, and boil it well for about three-quarters of an hour; then take out one-half of the liquor, and run it through a sieve into a vat; let the other half remain in the kettle for further use; put into the liquor in the vat, a quarter of a pound of alum, which has previously been dissolved in some vessel; stir the whole well, steep the light blue silk in it, and work it well in the liquor for a quarter of an hour; then take it out, wring and keep it wet for further use, and throw out the liquor as useless.

Lastly: pour into another vat the remaining eight buckets of the logwood liquor left in the kettle, after having first run it through a sieve; steep the silk in the liquor, and work it well therein for the space of half an hour; then take it out, rinse it in running water, wring and dry. By the above process, you will obtain a good dark blue, sufficiently durable.

Recipes for colouring red.

Madder-reds are usually put on woollens after they have been fulled, as the soap used in fulling changes the red. The cloths dyed madder-red are mostly of a coarse quality, such as flannels, long baize, mocks for embossing, and army cloths for common soldiers. Since the general introduction of the lac dye, most of the reds have been made with it.

I shall give two recipes for madder-reds, one for a piece of flannel and another for a baize weighing fifty-seven pounds, and it will be easy for those who wish to dye red, to add or reduce from the recipes, according to the weight of the material they may want to colour.

Dr. Cooper asserts, in his work on dying, page 156, that "the solutions of tin give but dead colours with madder." This assertion of the Doctor's is very strange, for no madder-red is ever dyed in England without the cloth being prepared with more or less of the solution of tin, and it is well known that the more is used in moderation, the better the colour will be. It is true, the tin liquor is not used in the same liquor with the madder, but unless the cloth is prepared with this material before dying, the colour will not be of a bright red, but rather of a brick colour.

For dying a flannel red.

For each one, use in the boiling or preparation, three pounds of alum, one pound of argol, or tartar, and half a pound of tin liquor.

The ingredients are put into the water when it is boiling, and the goods are boiled two hours and a half; when taken out they should be thrown until they are as cool as is pleasant to the hands; they are then to be thrown into narrow folds, rolled up close together, then wrapped up in a thick coarse cloth, and left three or four days, or until they become quite sour to the taste, and have a sour smell. A fresh liquor must be brought on, in which the goods are to be finished. When the water is near boiling, a gallon or two of bran is to be thrown in, which is to be scummed off just as it begins to boil. When the water is scummed clean, the heat must be lowered down to about 130° Fahrenheit. Let the madder now be put in and well stirred through the liquor; then the cloth must be rapidly entered and kept briskly turning over the reel, and well opened all the time it is working. For each flannel, of twelve pounds weight, use five pounds of the best crop madder. As soon as the cloth is in the furnace, put on the fire and bring the liquor to a spring heat in two hours, or about 206° Fahrenheit; then draw the fire and let the liquor cool down again for half an hour or more, when the colour will be finished. If the red should prove too yellow, put a small quantity of urine into the liquor, run the cloth again for ten or fifteen minutes, and it will be red enough. When the cloth is taken out of the furnace, rinse it well in clear water till clean, and dry it in the tenters as soon afterward as possible.

To dye a red on a long baize, weighing from fifty to sixty pounds.

For boiling, use ten pounds of alum, three pounds and a half of fine argol, and three pounds of tin liquor.

Boil the ingredients as before directed, then the cloth during two hours and a half, wrap up, and sour as before.

For finishing, use twenty-five pounds of the best madder, and proceed as for flannels.

Recipe for a madder-red, for twenty yards of broadcloth, in which the tin liquor is not used.

These colours are of a dark rich red, but do not approach as near to the scarlet as either of the others.

For the boiling, use four pounds of alum, and six ounces of cream of tartar. Boil the wares as for reds, run up, heave in the cloth, and boil it for two hours and a half—wrap them up, and let lay to sour.

For finishing, bring on a fresh liquor, and use to each yard nine ounces of the best crop madder. The cloth should be put in at a blood heat, and well reeled for six hours; by this time the liquor should just break out at a spring heat, the fire then be drawn, and the cloth run half an hour afterward. Proceed as for the other reds.

To dye lac-reds and scarlets.

In the year 1807, I was requested by Doctor Bancroft to try the colouring matter of the coccus-lacca. I did so, and it produced as fine a scarlet as any now produced from the same material. At that time, there was no lac-dye extracted in the East Indies for sale, and I had to obtain the colouring matter from the stick lac, which proved by far the most troublesome part of the process. Sometime during the same year, I entered a caveat for a patent; but having made up my mind to leave England for this country, a few months afterward I communicated the secret to a company's dyer, and never pursued the patent.

The East India Company soon afterward caused considerable lac-dye to be extracted from the stick lac in the East Indies, and to be sent to England for sale. A considerable quantity was imported, but being precipitated with alum, it was found to be insoluble, except by the addition of such quantities of alkali as rendered it unfit for the red or scarlet dyes. On discovering their error, the company sent a chymist to the Indies, to find a precipitant for the colouring matter, that would not injure its solubility. This being accomplished, the article has since been brought into general use.

Lac is probably of much greater value than cochineal, in such colours as red and scarlet, as it may be made equally brilliant in hue, and as it will not change so readily when it comes in contact with an alkali. It is usually sold at such a price as to enable the dyer to make a scarlet at less than half the price he can obtain it from cochineal. In fact, the cost of dying this brilliant scarlet from lac, is not so great as that from madder at fifteen cents per pound.

In giving recipes for this cheap and splendid colour, I shall first give such as I obtained from a Scotchman, and then follow them up by such as I consider, from my own practice, to be improvements.

The first colour that is dyed in a fresh liquor is never so fine as the second and following colourings; it is usual, therefore, to make the first with half the materials prescribed for a full colour and to make it up afterward with the other half.

Scotch recipe for dying lac-scarlet.

To make lac-spirits. Take one measure of aquafortis duplex, two measures of muriatic acid, add a little tin till it becomes hot, then add one measure of water, and saturate with tin, that is, give it as much tin as it will take. Then take any quantity of muriatic acid, and dissolve in it half an ounce of tin to a pound of acid.

To dye twenty pounds of cloth, worsted, or yarn.

If the lac is good in quality, take two pounds and a half, and more according to the quality of the lac. Take two pounds of each of the above solutions, and mix with the lac in a stone-ware dish. Take a clean copper, or tin boiler, suited to the quantity of goods, fill it with pure water, and add a pound and a half of fine argol, or cream of tartar; steep one pound of quercitron bark in hot water, and strain into the boiler the clear liquor; then add the mixed lac, enter the goods and boil them from an hour and a half to two hours—wash and dry.

Another Scotch recipe for making lac-spirits.

Take twelve pounds of aquafortis duplex, reduce it to single, or 20° Baume, add two pounds of spirits of salt, and then add as much tin as will bring them to a dark amber colour. It generally takes from two ounces and a half to three ounces of tin to a pound of single acid. Add the tin slowly so as not to raise a heat. When you have got them to the colour, add sixteen pounds of spirits of salt, stir them well, and they are ready for work. Use the same proportions in colouring as for the above recipe, and observe the same process in dying.

The above recipes would be somewhat dangerous in the hands of a careless dyer; for when the compound contains but little more than the above proportion of aquafortis, or the duplex acid should be a little stronger than the prescribed standard, the tin liquor and the lac-dye will decompose each other. I have known this to happen frequently with those who thought themselves to be skilful dyers. Aquafortis, of a given strength, will always decompose animal matter, but spirits of salt exerts no action on it; therefore the latter is always the safest to use. When nitro-muriate of tin is preferred, I would recommend the dyer using it, to put it into the liquor with the argol, or cream of tartar, and add the lac afterward.

William Partridge's recipe for dying twenty pounds of stuff a lac-scarlet.

Prepare the water by boiling bran in it, and scumming off after the same manner as for scarlet, with cochineal.

Take two pounds and a half of fine-ground lac-dye, of good quality, and mix it with four pounds of muriate of tin, in which the acid is in considerable excess. Put into the boiling liquor two pounds and a half of fine-ground argol, or cream of tartar, add the mixed lac, enter the goods, and boil forty-five minutes, wash and dry.

From six to eight dyings may be done in one day in the same liquor, and I would recommend to run the first with half the materials, then to make a full colour from this, by using the other half, after the second or third colouring.

If the colour should prove too yellow, that is, too much approaching an orange hue, leave out a portion of the argol, or cream of tartar, and the colour will be more decidedly red, and this as the argol is diminished.

To dye red with mungeet, on fifty pounds of woollen.

Prepare the goods previously with a little black-oak bark, ten pounds of alum, and two quarts of tin liquor.

The next day, colour with mungeet in a fresh liquor, using the same quantity as of madder, or rather less, and dye without boiling. This colour is as permanent as madder, and superior in tint. It may be applied to cotton as well as wool.

An improved mode of preparing woollen goods for receiving lac-dye, discovered by the writer last year.

From experiments made on some of the prepared samples, I am led to conclude that the same preparation, or some modification of it, may be usefully applied to almost all the vegetable dyes, and more particularly to the red.

To every pound of woollen yarn or cloth, take an ounce of chloride of lime, and one ounce of sal-soda; pour on to the two, one gallon of scalding water, stir well, and let it settle. When settled, pour the clear liquor off, and throw it into a furnace, adding more water, if necessary, to make up enough to boil the goods in. In this, boil the cloth or yarn for ten minutes, and lay by for use. It is better to dry the liquor in the cloth, and wash before dying; for if not washed, the colour will be too heavy.

My experiments were all made on the scale of forty grains of woollen yarn, and if the benefit to be derived on a large scale shall bear any proportion to those made on forty grains, it must add to the value of the lac-dye full one-third, if not one-half.

To dye red on cotton.

It is to be understood, that in the recipes I obtained from Manchester, for dying of cotton, there will usually be given two for producing each colour—the first will be for the best and most permanent colour, and the second for such as are common and cheap.

Recipe to dye a fine and permanent red on cotton, in which there are five different processes.

First Process. After the cotton has been well boiled and washed, dry and divide it into handfuls of half a pound each; tie a string round each parcel loosely, so as to leave room for the dye to penetrate under the strings. For each pound of cotton, take four ounces of well-pounded nutgalls, boil them half an hour, or until the galls are soft, and for every pound of cotton, add five quarts of water. Take five quarts of this liquor, into which dip a pound of cotton, until thoroughly soaked; repeat the operation three times, then put the cotton into another tub, and pour the gall liquor on it—proceed in the same way with every pound of cotton, until all is done; let the whole lie until next morning. Then wring out evenly, so that the hanks may be equally pressed in all parts, then dry it. Warm the gall liquor, proceed as before, and let the cotton lie in another night, wring out as directed after the first galling, and dry.

Second Process. To every pound of cotton, dissolve half a pound of fine-pounded alum in five quarts of water, in a copper pan. When the alum is dissolved, add to every pound of it two ounces of pearlash—proceed in soaking and drying the cotton twice, as directed for galling; with this difference, that it lie in the alum liquor four or five days. Before maddering, put one pound and a half on each stick, wash it quite clean in running water, and wring well.

Third Process. Take a tub large enough to wash the cotton in, fill it with warm water, and dissolve in it one ounce of pearlash for every pound of cotton; turn the cotton in as you would yarn in a blue vat, work it in the liquor for fifteen minutes, wring out evenly, and it will be ready for the following process.

Fourth Process. Take a broad copper pan, large enough to hold for every pound of cotton, twelve quarts of water; put into this liquor one pound of the best crop madder for each pound of cotton, fill the pan to within seven or eight inches of the top—when the madder is in, break the scum on the top, place the cotton on sticks, as before directed, and when the water is milk-warm, turn the cotton in as in the blue vat—bring the liquor to a boiling heat in one hour and a half, but not to boil out; let it lie at that heat for fifteen minutes, then draw the fire, place the cotton hollow and straight, and let it lie for an hour or so; then raise it out of the liquor and wring gently, shaking the madder well out of it, one string at a time; wash clean from the madder, and wring the cotton evenly and dry. In the summer dry it in the shade, in the winter in a stove.

Fifth Process. If the colour is not deep enough, take to every pound of cotton, four ounces of brazilletto chips, boil them one hour, strain off the liquor into a tub, and add to it urine or lime until the liquor has a pink cast. When the liquor becomes cool enough to bear the hand, put in the cotton and turn it over eight or ten times, then heave it out of the liquor and add for every pound of cotton, half an ounce of alum dissolved in hot water, turn in eight or ten times, wring out and dry.

Recipe for a common red on cotton.

After the cotton has been well boiled and washed, use to each pound, one ounce and a half of galls, and boil as before; turn in the cotton, squeeze out, turn in again, handle well, and let it lie all night. Wring it out in the morning, and for each pound of cotton boil one pound of chipped brazilletto for half an hour, take off the clear liquor, and add a little urine or lime until it has a pink cast when a drop is let fall on the back of the hand; fill up the pan and boil the chips a second time for half an hour, and proceed with this liquor as with the last, when it is so cool that you can bear the hand in it; dissolve for each pound of cotton two ounces of alum and add it to the liquor, mix well and turn in the cotton, work quick at first, then slower; turn down and let it lie one hour then wring out and turn it in the liquor that was first boiled, work it well in this and turn it down for fifteen minutes, then raise it out and wring a little to see if it is of the right shade should it be too much on the crimson, you must dissolve for each pound of cotton half an ounce of alum, in the colouring liquor, turn in the cotton again and handle it eight or ten times, wring out and dry—in the summer in the shade, in the winter in a stove, or warm room.

Recipe to dye silk of a blood-red colour.

I cannot answer for this recipe; it was given me by a person who was a silk dyer, and as such I shall add it.

For each pound of silk, take one pound of alum, and a quarter of a pound of cream of tartar; boil them in a pailful of water for twenty minutes, let the silk steep in this liquor for two or three hours, take it out, rinse, and beat on a block, then hang up and dry.

Put four ounces of powdered Aleppo galls into a pailful of water, set it over the fire until the hand can just bear the heat, then put in the silk, let it lie two hours, take out and dry.

Put into a linen bag half a pound of ground Brazil wood, boil it in four quarts of bran-water, keep the kettle covered while boiling, then take the kettle off the fire and let it stand all night; in the morning add to it a quarter of an ounce of potash, boil it again one hour, then pour it into as much river-water as there is liquor.

Take out the bag containing the Brazil wood, skim the liquor, and put in the silk; cover the vessel close and let it remain one hour, wring out and rinse very clean in river-water, repeat the operation and dry it in the shade; if the colour be not strong enough, boil the dye again and repeat the operation. Pass the silk through a lather of soap, and rinse in clear river-water.

A German recipe for red on silk, for ten pounds.

A deep red. Take one pound of fine galls, two pounds and a half of alum, half a pound of tin liquor, and five pounds of best madder.

Put into a kettle eight buckets of water, and one pound of fine galls; let it boil about fifteen minutes, or until the strength is extracted; run it through a sieve into a vat, steep the silk in this decoction, and work it well therein for about two hours; after which, take it out, rinse, and dry it. Then put into a kettle eight buckets of water, with two and a half pounds of alum, and half a pound of the composition: let these be properly united with the water; pour the liquor into a vat, steep the silk in the solution, and work it well therein for four hours: take it out, rinse, and lay it by in its wet state, for further use.

Lastly. To complete this colour, put in a kettle ten buckets of water, and five pounds of madder, and work the silk well in this liquor, until it begins to boil; then take it out, rinse, and dry it.

Second German recipe for a handsome red.

For ten pounds of silk. Take eight ounces of annatto, one pound and a half of potash, two pounds and a half of alum, six pounds of Brazil wood, five buckets of sharp vinegar, and six ounces of tin liquor.

The tin liquor is a nitro-muriate, made with sal-ammoniac and aquafortis.

Boil a kettle with eight buckets of water, put in it eight ounces of annatto, and add one pound and a half of potash; let the whole boil well for a quarter of an hour, and pour the liquor through a sieve into a vat. Steep the silk in this liquor, and work it well for two hours, after which take it out, rinse, wring out, and dry it.

Then dissolve one pound and a half of alum in a kettle with eight buckets of water; pour this solution into a vat, fix your silk upon rods, and work it well therein for two hours; then take it out, wring and dry.

When the silk is completely dry, steep it in warm water, until it has become properly soaked. Then take it out, wring and lay it by wet, for further use.

This being done, pour into a vat five buckets of sharp vinegar, and six pounds of Brazil wood, and let it stand for the space of forty-eight hours; then take the liquor out of the vat, and pour it into a kettle; let it boil for the space of ten minutes; then pour it through a sieve into a vat, and throw the parts remaining in the sieve into the kettle again; pour three buckets of water on it, let it boil well for a quarter of an hour, and add the liquor thereof to the other Brazil liquor in the vat.

Pour six ounces of the composition (tin liquor) into this liquor of Brazil wood, and stir it well; steep the silk previously soaked in warm water, in the liquor, and work it well therein for two hours. Examine, at the expiration of this time, whether the liquor still contains any colouring matter; if so, take it out, pour it into the kettle again, work the silk another time therein, during which it must be kept moderately warm; then take it out, rinse it in running water, wring, and hang it up to dry. By observing the whole of the above process you will obtain a very handsome red. By using eight buckets of vinegar, the colour will be much improved; and by leaving out the tin liquor, the colour will become darker.

Lastly. If you desire to have this colour of a darker and fiery hue, add two pounds of Brazil wood, and one pound of tin liquor, to the above quantity, and proceed as above directed.

To dye yellow on wool and woollen cloth.

For a piece of Lancashire flannel. For the boiling, use three pounds of alum, and half a pound of tin liquor.

Boil the ingredients for half an hour, heave in the flannel, and boil it two hours.

It must be finished in a fresh liquor, with weld and a small quantity of pearlash. This is a highly permanent and very beautiful colour. Goods prepared the same as this in the boiling, and finished in a separate liquor, in a strong decoction of black-oak bark, makes a fine yellow, but by no means so beautiful as the weld.

In both weld and black-oak bark, the bath must never boil whilst the cloth is dying, nor before the goods are put in, for nearly all the vegetable dye-drugs, giving a yellow, contain a dead dun colour, which is not extracted below a boiling heat.

To colour nine pounds of wool a fine yellow.

Boil with one pound and a half of alum for three hours, and let the wool lie in the liquor all night; take it out in the morning, wash and bring on a fresh liquor; finish with nine pounds and a half of weld, boil a quarter of an hour, and let lie in all night. Take out in the morning, wash and dry.

To colour eighty-five pounds of wool of a strong yellow.

Boil with ten pounds of alum, let lie in all night; take out in the morning and wash, then in a fresh liquor boil thirty pounds of weld, and six pounds of fustic. Boil the ingredients two hours, cool down, heave in the wool, and boil one hour; run the furnace up until cool, land the wool, wash and dry it.

Black-oak bark may be used in place of weld, taking about half the quantity, or rather less.

For dying yellow on cotton.

First recipe. The cotton for this colour must be very well cleansed previously to dying, and, when bleached, it will take a fine colour. Whether it is raw or bleached, it must be boiled in the twisted hank, in soft water, until it sinks in the liquor, and it must then be washed well. To prepare it for receiving the dye, boil it with six ounces of alum, and one ounce of verdigris, for each pound of cotton; alum it twice, as directed for red, and in the second aluming let it lie four days. When it has been well alumed and dried, boil one pound of fustic for every pound of cotton, and make as much liquor as will soak the cotton twice; take half the liquor and turn in the cotton. When the colour is nearly drawn out of this, wring out, and turn in the other half of the liquor; when the colour is drawn out of that also, which it will be in about fifteen minutes, wring out, and it is finished.

Second recipe. When the cotton is dry, after aluming, take one pound of weld, and one ounce and a half of pearl-ash, to each pound of cotton—when this liquor has been well boiled, wring the cotton, and turn it in at the usual heat for fifteen or twenty minutes, then raise it out; dissolve one ounce of blue vitriol to each pound of cotton, put it into the former liquor, turn in the cotton for fifteen minutes, wring out, and it is done.

This colour will have a green cast, which is much admired; but if wanted of a golden yellow, it may be produced by boiling two or three ounces of annatto in a saucepan, with two or three ounces of pearlash, adding a very little of this solution to the weld liquor before putting in the cotton; but if too much of this is added, the yellow will be brown.

Third recipe. Let the cotton be boiled and washed well. Dissolve for each pound, one ounce of alum, turn in the cotton, handle well, let lie for half an hour, and wring out even. For each pound of cotton, use one pound of ground black-oak bark, add to it one-eighth of an ounce of pearlash, and pour on it as much boiling water as will soak the cotton twice; stir these together well, take half the liquor, turn in the cotton at the usual heat, work it well, and raise it on a pin. To each pound of cotton, dissolve one drachm of verdigris, add it to the first liquor, and turn in the cotton for twelve or fifteen minutes—wring out, and give it the other half of the liquor, adding, after it has been dipped in this, the same quantity of verdigris as in the last, wring out, and dry in the shade.

To dye yellow on silk.

First recipe. Boil the silk in soap till white, wash it out well, alum, and then wash it twice in cold water. Fill a furnace with clear cold water, put into it half a bundle of weld, and bring it to a spring heat, but not to boil out. Prepare a bath of clear soft water, and put into it of the yellow-weld liquor to the colour wanted. If for a deep yellow, make up and finish in a lather of soap; but if for a jonquille, this is not wanted—wring out, and dry in a stove.

Second recipe. Use of alum, three ounces to one pound of silk; sugar of lead, one ounce to one pound of alum; fustic, one pound to one pound of silk; water, one or two gallons, in proportion to the shade required. Immerse the silk overnight in the solution of alum and sugar of lead, take it out wring, and dye it in the fustic.

Third recipe. For ten pounds, take one pound and a quarter of alum, and seven pounds of French berries, or four pounds of Turkey berries. Put the alum into a kettle, with eight buckets of water; when dissolved, pour it into a vat, immerse the silk in the solution, work it well therein for half an hour, take it out, lay it aside in its wet state for further use, and throw away the solution. Then boil ten buckets of fresh water, put into it the berries, boil for three-quarters of an hour, pour it through a sieve into a vat, and immerse the silk in the liquor, work it well therein for half an hour, wring out, and fix it on the wringing post.

A small quantity of alum may be added to the berries, and boiled with them, which improves the colour.

To make this colour deeper or brighter, take more or less than the above quantity of the berries.

Fourth recipe. For a citron-yellow, on ten pounds of silk, take two pounds of alum, and six pounds of ground quercitron-bark. Put the alum into a kettle, dissolve it in ten buckets of fresh water, pour the solution into a vat, immerse the silk in it, work it well therein for two hours, wring out, and lay it aside wet for further use—throw away the solution of alum. Then put the ground quercitron-bark into a kettle, with ten buckets of fresh water, boil it one hour, take it out, run the decoction through a sieve into a pail, immerse the silk in the liquor, and work it well one hour; after which, it is to be taken out, wrung, and dried; fix it on the wringing post, wring it a second time, when it will be a beautiful citron-yellow.

This colour may be much heightened, by adding a small quantity of soda, more or less, to the above yellow liquor, according to the shades of colour desired; but this must not be done till the yellow is dyed.

To dye chrome-yellow on cotton and silk.

This colour has been in use only for a few years, and has already superseded almost all other yellows. There is none so clear and beautiful, and as it is as permanent as any other, it must always take the preference. The advantage of using chrome, for dying yellow, is felt by the dyer, as it may be done in a cold state, thereby saving fuel, and in any quantity at a time, without loss of material.

Process. For every one hundred pounds of yarn, take twenty-four pounds of sugar of lead, and eight pounds of bichromate of potash; dissolve the lead in fifty, and the bichromate in six gallons of water. For the first ten pounds of yarn, take about twelve gallons of the lead liquor and make up a tub, (a half-hogshead,) and about one gallon and a half of the chrome liquor and make up another tub. The tubs must be filled with water nearly to the top. When the first ten pound bundle has been through the lead tub, giving it four turns, it is wrung out, and entered into the chrome tub, where it also gets four turns, and is wrung out. For the second ten pound bundle, four gallons of the lead liquor is taken out of the working tub, and replenished with four gallons of fresh lead liquor; about three-quarters of a gallon of the chrome liquor is taken out of the working tub, and replenished with three-quarters of a gallon of fresh chrome liquor, and so on alternately, until the whole is finished. If a strong yellow is wanted, use nitrate of lead in place of the sugar.

Silk is dyed after the same manner as cotton. The application of chrome to silk is said to injure the quality so much, as to give it the appearance of cotton, on which account it is never used by experienced silk dyers.

We began our dying recipes with black, and have proceeded to give directions how to make the dyer's three primitive colours. Before giving recipes for making compound colours, we will give instructions for dying white on woollens and silks, and stoving them.

Many of the woollen cloths and cassimeres are coloured white, for military uniforms and facings, and it is for such purposes they are generally used. White cassimere waistcoats, however, are occasionally fashionable, as well as white cloth pantaloons. Flannels are often whitened and stoved by sulphur bleaching.

Recipe for colouring one hundred and sixty pounds of woollen cloth a uniform white.

The cloth must be drawn over a perch, to see that it is clear in the ground, and free from iron-moulds, or any other stain that may be likely to show when coloured. It has then to be well scoured with fullers-earth, and afterward looked over again, to see if any defects appear that were not before visible; and if there are any that will not discharge by rubbing with warm soap-suds, the cloth will not be fit for whitening.

While the cloth has been preparing, a clean copper furnace, holding one hundred gallons, must be nearly filled with water, and made to boil; while the heat is coming up, shave into it twelve or fourteen pounds of the best white soap. Care must be taken, when it begins to boil, that it does not flow over the furnace, which it is very apt to do; to prevent this, keep a bucket of cold water by the furnace, and when you find that stirring with a rake will not prevent its rising, pour in the water. When the liquor has boiled a sufficient time to dissolve all the soap, take a bucket of the liquor, say three gallons, mix it with three of soft water, and with it scour the cloth again in the stocks, without washing out the soap.

Uniform whites may be coloured either in large wooden backs, or in a copper furnace, with a white-willow basket made to fit the inside. Whatever vessels are intended for this purpose, they must be such as will not impart any stain to the goods, and must be kept clean and exclusively appropriated for that purpose.

When done in a furnace, it must be made very clean, and filled with perfectly clean water. A fire is to be put under, and the liquor raised to the temperature of new milk; at this heat, as much of the boiled soap should be added as will make the liquor very white; when this has been added, and the liquor stirred so as to mix the soap well through it, a small quantity of chymic is put in, just enough to make the liquor a sky-blue, or darker, if the colour requires it. Some uniforms are of a natural white, when they require only soap and sulphuring; they vary from this to a very blue white, approaching to a faint sky colour—the latter is never sulphured. The blue mixture has to be passed through a bag; some stout flannel is sewed in the form of a jelly-bag, and the top is secured round a wooden hoop. This bag is first wet, then placed in the furnace, and the soapy liquor will pass through it, and fill the inside; into this part of the liquor a small quantity of chymic is poured, and stirred until it is well mixed; the bag is then drawn up by the rim, and the diluted blue permitted to pass through into the furnace—the whole is then well stirred with a rake, so as to mix the blue completely with the soapy liquor. The cloth is then entered, rapidly moved over the reel, and kept well open during the whole time of working. Put in, at the heat of new milk, as before mentioned, bring the heat up five or six degrees, and in thirty or forty minutes the colouring will be finished.

This colour is not washed, but the cloth is folded up carefully and smooth, and laid in a clean cloth, on a scrave, horizontally; for if thrown across a dyer's horse to drain, the colour will run to the lists. When cloth has been dyed white, it is always stove-dried.

On some occasions, the whites that are dyed without bluing, are hung up in a sulphur house to bleach. A sulphur house, for bleaching cloth, is a square building, closely plastered, to prevent the sulphurous gas from escaping. The cloth is hung up by the list, on wooden hooks, and no two folds are permitted to touch each other. The cloth, when hung up, should be thoroughly moistened with the whitening liquor, but not so wet as to run. When the house is filled with cloth, or the intended quantity is hung up, some roll-sulphur, bruised, is put on four iron dishes, which are previously covered two or three inches thick with fine dry cilicious sand; one of these is put in each corner of the room, and a small hole is left at the bottom of the building, near each pot, say three by four inches, to admit a supply of air for the purpose of keeping the sulphur in a state of combustion. When the sulphur is set on fire, the door is closed until the following morning, when it is thrown open, and as soon as the workmen can enter with safety, the cloth is shifted, the lists that hung down being now turned up and hooked on the tenters. More sulphur is now placed on the sand plates, which is ignited as before; when the cloth has undergone this second process, it is finished sulphuring, and will have to be tentered and dried.

It is necessary to observe, that cloth intended for uniform white is finished shearing before it is coloured; and that after it is dried, it need only be beaten in the tenters with small white-willow rods, to extricate any soap that may hang on the face in a state of dust—the beating should be done very lightly. Sometimes a small quantity of the best whiting is used in the soap liquor, but this is seldom necessary if good soap be employed.

To colour white on silk.

Boil off with yellow cake-soap, four pounds to each twenty pounds of silk; then cord off twenty skeins on each cord, and put them in a bag; put into a copper kettle the four pounds of soap, with a small quantity of red orchille, in which boil the bag for three hours, wring out by handfuls, and hang up four handfuls on a stick. Draw off and pump up; make a weak lather, and put indigo into it, according to the colour wanted. If the colour is required to be more on the red, use more orchille. This is done at a good heat, and a few turns will finish it.

On compound colours.

Having given recipes, and modes of working for black and white, and for the dyer's three primitive colours, blue, yellow, and red, we will proceed to the compound colours, and shall commence with those that are compounded of blue and yellow, constituting all of that genera known by the name of green. I shall, that my directions may be more clearly understood, divide this genera into four distinct classes: the true green, those colours which are dyed with blue and yellow alone, in which neither of those shades predominate in any considerable degree; the yellow-green, in which the yellow predominates; the blue-green, in which the blue has the ascendency; and, finally, those greens in which the red enters into the composition.

When cloth is to be dyed green, it must previously be well scoured with fullers-earth.

Of true green.

The following recipe is for a full bodied colour of this green, on thirty-three yards of seven-quarter Spanish broadcloth, weighing about forty-six pounds.

For boiling, use eight pounds of alum, and one pound of chymic. Boil them together for half an hour, then throw in the cloth, boil it one hour, take it out, and boil in the same liquor thirty pounds of chipped fustic, five pounds of alum, and three pounds of chymic. Boil the alum and fustic for one hour, then add the chymic, pouring it into the boiling liquor in a small stream, not larger than the size of a wheat straw, to prevent its blowing out; let the liquor boil ten minutes, fill the furnace with cold water to the proper height, stir the liquor well with a rake, enter the cloth, and rattle over the reel as fast as two men can open it; for unless this is done rapidly, the colour will be uneven, as the blue strikes instantly. Bring the furnace to a boil, and keep it boiling till of the colour wanted.

In colouring green, when chymic is used, it is essential to know that the goods take the blue first, then the yellow, and that the longer they boil, the yellower the colour will be. Therefore, in dying two or three pieces at once, as many different colours as there are pieces may be taken out of the furnace successively.

When the desired colour is obtained, the cloth should be wound up on the reel rapidly, and immediately thrown off into a back of clear cold water. It must then be cleared by streaming, as directed under the article for cleansing of cloth.

For a very light grass-green, for forty-one pounds of cloth.

Put into the water, before it boils, a quarter of a peck of bran, and one pound of muriate of tin, bring the liquor to a boil, and, when slowly boiling, scum off the bran as it rises. When the liquor has been well scummed, add seven pounds of alum, and one pound and a quarter of chymic. Boil the alum half an hour, then add the chymic, and boil ten minutes; run up the furnace, stir well, throw in the cloth, and boil it one hour. In the same liquor, boil ten pounds of fustic, one pound and a half of chymic, and two pounds of alum.

Boil the fustic and alum as in the last recipe, and add the chymic as there directed, boil as usual, stir the liquor well, throw in the cloth, boil it until of the desired colour, cool down, and heave out into a back of water. When finished, proceed as with the last.

Very permanent greens of any colour may be made on cloth, by blueing it in the woad vat more or less, according to the colour wanted; then making a liquor with one-sixth of its weight of alum, and as much fustic as will make the desired colour.

To dye wool a true green.

For a full bodied dark green, on two hundred and three pounds of wool. To be first dyed a middling blue, in the woad vat, then finished in the furnace with eighty pounds of fustic, and twenty pounds of weld.

The fustic to be boiled by itself for two hours; the weld to be entered and boiled twenty minutes. The dye-wares are now to be taken out, the furnace run up, the liquor well stirred, the wool entered and handled as before directed, for half an hour, the heat to be brought on and boiled two hours. The furnace must now be run up with cold water, and four pounds of alum strewed over the liquor by handfuls at a time, the wool to be well raked and briskly handled at the time, and between the throwing on of each handful; when the alum is all in, put on the fire and keep handling until the liquor begins to boil, permitting the liquor to boil for half an hour; then open the furnace door, run up, and let it lie all night.

It must be observed that wool should never be landed out of a very hot liquor, for this makes it stringy and difficult to work in the machines. When a furnace of liquor has laid with the wool in it all night, it will be about cool enough to run off in the morning; should any circumstance make it necessary to run off immediately after it has boiled, the liquor should be cooled down to 140° Fahrenheit, before the wool is left free of liquor. To perform the running off, without permitting any wool to go with the liquor, let the workman, before turning the cock, thrust the wool from before the opening with two or three large sticks; when this has been done effectually, put a circular shovel between the mouth of the cock and the sticks, by which means the liquor will be permitted to run off freely without any wool following it.

Second recipe for green on wool—a true green.

The wool to be coloured in the vat as before. The colouring materials, prescribed in this recipe, are for twenty pounds of wool. Use four pounds of weld, nine pounds and three-quarters of rasped fustic, and three-quarters of a pound of logwood.

The materials to boil one hour, the bags taken out, the liquor run up with cold water, the wool put in, and boiled two hours, then strew over two pounds and a quarter of alum in the same manner as directed for the last; boil again for half an hour, and let it lie in all night.

For a very light true green—to be first dyed a very light blue.

It must be understood that in all cases when a furnace colour is done on a blue ground, and particularly when the colour is light, the blue must be washed very clean before it is dyed, otherwise the colour will have a very dull and muddy appearance when finished.

This light colour has first to be boiled in four pounds of alum for twenty-four pounds of wool, and let lie in the liquor all night; and then, without washing the wool, bring on a fresh liquor, in which boil sixteen pounds of weld, run up, heave in the wool, boil two hours, and let it lie in all night.

This recipe makes a very beautiful green, being much like that which is seen on the plumage of a peacock.

There is no dying-drug that produces so fine a yellow as weld, and it imparts a softness to the wool that no other appears to give.

For a true green for sixteen pounds of wool—to be woaded blue, as usual.

For the boiling, use eight pounds of fustic, and five pounds of weld. The dye-wares to boil two hours in bags, as usual; the furnace run up and well stirred, the wool thrown in and boiled two hours; then cooled down, and strew over it one pound of alum, and one pound and three-quarters of copperas. After these are in, and the wool well handled, bring the liquor to a boil, and let it lie all night.

Recipes for green, in which the blue predominates.

There will be no occasion to give any recipe for making this colour on cloth, as they may be easily made by lessening the quantity of fustic, and increasing that of the chymic, upon any of the recipes for true greens.

To dye sixteen pounds of wool, in which the blue slightly predominates.

To be first dyed blue in the vat, such as can be done for about ten cents a pound; then boil seven pounds of fustic chips, and one pound of logwood, in a bag, for two hours; take out the bag, run up, heave in the wool, and boil it for two hours; then run up again, and strew in two ounces of pounded blue vitriol, two ounces of pounded alum, and two ounces of copperas; boil one hour, and let it lie all night.

Recipe for a blue-green, where the blue is stronger than the last, for two hundred and forty pounds of wool.

Dye in the blue vat to a fifteen cent blue. For the boiling, use sixty-six pounds of chipped fustic, twenty pounds of weld, one pint and a half of chymic, and one pound of pearlash.

Let the fustic boil in bags two hours, then heave in the weld in bags, and boil half an hour; take out the dye-wares and put in the chymic as directed for cloth; when this has been boiled, add the pearlash in small quantities at a time, then run up and stir well, after which, heave in the wool rapidly and handle very quick—boil two hours, run up, and strew over eight pounds of argol, and twelve pounds of alum; boil one hour, and let it lie in all night.

For a very light blue-green, for sixty pounds of wool.

Use fourteen pounds of weld, and three cups full of chymic. Cause the welds to boil half an hour, then take out, and add the chymic as before directed; the liquor must now be run up, the wool thrown in, and handled quick: then boiled two hours and cooled down; when this has been done, strew over six pounds of pounded alum, and three pounds of argol—boil one hour and let it lie in all night.

Recipe for a very dark green, rather inclining to the blue, for sixteen pounds of wool, previously dyed a fifteen cent blue, in the woad vat.

For the boiling, use seven pounds of chipped fustic, and two pounds and a quarter of chipped logwood.

The wares to be boiled in a bag two hours, the liquor run up, well stirred, and the wool thrown in. Let it be one hour coming to a boil, and boil two hours; then cool down, and strew over fourteen ounces of alum—boil half an hour, cool down again, and add five ounces of copperas, and one ounce and a quarter of pearlash, boil one hour, and let it lie all night.

For one hundred and forty-eight pounds of wool for a dark blue bottle-green—to be first dyed in the woad vat to a thirteen cent blue.

For the boiling, use thirteen pounds of umbro madder, and one hundred and thirty pounds of logwood.

Let the wares be boiled two hours, the liquor cooled down, well stirred, and the wool entered; then the wool is to be boiled three hours, and when it is cooled down, strew over it four pounds and a half of alum, and thirteen pounds of copperas; boil half an hour, cool down, and let it lie all night.

For a middling blue-green for two hundred and five pounds of wool—to be first woaded a nine cent blue.

Use twenty-one pounds of alum, boil this half an hour, heave in the wool and boil it two hours; then heave out and wash.

Prepare a fresh liquor, and boil in it forty pounds of chipped fustic, and seven pounds of umbro madder.

Boil the wares two hours, cool down, heave in the wool, boil it three hours, and let it lie all night.

For a very light green, in which the blue predominates—for fifty-six pounds of wool, first woaded to a four cent blue.

For the boiling, use nine pounds of fustic. Let the wood be boiled two hours, the bag taken out, the furnace run up, the wool thrown in and boiled three hours, and let it lie all night.

Recipes for green, in which the yellow predominates.

In these, will be included bronze and olive-greens. Bronze-greens are those colours which are of a rich olive, having a very strong body of yellow.

For a rich bronze-green for sixteen pounds of wool that has been coloured a full twenty cent blue.

For the boiling, use six pounds and a half of chipped fustic, and four pounds of weld.

Let the fustic boil two hours, then heave in the weld, and boil half an hour; take the wares out of the liquor, stir, heave in the wool, and boil it two hours; then cool down and strew over it three-quarters of a pound of alum, and one ounce of dissolved copperas—it must now boil one hour, and let lie in all night.

For a bronze-green on two hundred and sixty pounds of wool.

This is for a rich and very full colour. It has first to be dyed in the vat, of a light seven cent blue.

For the boiling, use one hundred and eighty pounds of chipped fustic, seventy pounds of weld, and four pounds of chipped logwood.

Let the ingredients be boiled as before, for two hours, the furnace run up, well stirred, the wool thrown in and boiled two hours; then cool down, strew over it twelve pounds of alum, and two pounds of argol; boil again one hour, let the liquor be cooled again a second time, and strew over it nine pounds of dissolved copperas, and one of ground logwood; let the liquor boil one hour, and the wool lie in all night.

To dye sixteen pounds of a lighter bronze, and not so dark as the last. This has to be woaded to a light fourteen cent blue.

For the boiling, use seven pounds of chipped fustic, and four pounds of weld.

The wares to be boiled two hours, the bags taken out, the liquor cooled down, well stirred, and the wool thrown in and boiled one hour and a half; then cooled down, and strew over it one pound of alum; boil one hour, cool down again, and strew over it one ounce of dissolved copperas; boil three-quarters of an hour, and let it lie all night. This is called an emerald green, and is a very beautiful colour.

For a fine olive-green on sixteen pounds of wool, to be woaded to a nine cent blue.

For the boiling, use sixteen pounds of chipped fustic, and four pounds of weld.

Boil the fustic two hours, then the weld half an hour; take out the dye-wares, run up with water, stir well, heave in the wool, and boil two hours; then cool down and strew over it one pound of alum, and four ounces of dissolved copperas.

For a dark bottle-green of the bronze hue, for one hundred and forty pounds of wool, made a full eleven cent blue in the woad vat.

For the boiling, use eighty pounds of chipped fustic, and fifteen pounds of weld.

Boil the wares as before, cool down, stir well, heave in the wool and boil two hours; then cool down, and strew over it seven pounds of pounded alum, and three pounds of madder; boil one hour, and let it lie all night.

For an invisible green on two hundred and forty pounds of wool—a colour now very fashionable.

For the boiling, use seventy pounds of fustic, thirty-five pounds of logwood, eight pounds of argol, and twelve pounds of alum.

Boil as usual, wash the wool, and run it in the blue vat until of the desired colour. The stronger the blue, the more it will approach to the invisible hue.

To dye bottle-green of different shades, on twenty pounds of wool.

Take from four to ten pounds of fustic, three to twelve pounds of logwood, for the boiling, and sadden with one pound of alum, and from one-quarter to half a pound of copperas.

The wool to be first dyed a fourteen cent blue in the woad vat, and proceeded with as directed for other greens.

To dye red-greens.

For all greens intended to have a red hue, take any of the foregoing recipes for green, leave out more or less of the yellow dyes, and add barwood in their place. If required very dark, use the usual quantity of fustic, and add from two to four pounds of barwood to every twenty pounds of wool. As much madder would be still better than the barwood.

As the weld plant is an article not much used in this country, I would beg leave to observe, that by using about half the quantity of fustic, the body of the colour will be about the same.

Having gone through all that will be necessary for colouring of green on wool and woollen cloth, and having given ample directions for each class of that colour, I shall now proceed to give recipes for producing greens on cotton and silk.

The two following recipes are for dying green on cotton.

Cotton for this colour must be well boiled in a solution of potash, then washed, and dyed blue in the copperas vat, to the shade wanted. When it comes from the vat, dry it, wash a little, and dry again; then alum as for red, with six ounces of alum to each pound of cotton, wash and dry it. Boil eight ounces of fustic for each pound of cotton; when well boiled, take out the liquor, put it in a proper tub, and when you can bear the hand in it, put the cotton in, turn it eight or ten times, and raise it out of the liquor; then dissolve one ounce of blue vitriol for each pound of cotton, put it into the fustic liquor, turn the cotton into it, and work it round eight or ten times; then turn it down, let it lie for twenty or thirty minutes, wring out, wash and dry, and it is finished.

Second recipe, is cheaper, in which part of the blue is directed to be put on with logwood.

Boil the cotton well, wash it, and give it a light ground in the cotton blue vat; boil one pound of fustic, and four ounces of logwood to each pound of cotton; after boiling well, take off the clear liquor, and when you can bear the hand in it, turn in the cotton several times; then turn it down into the liquor for half an hour, raise out on a pin, and let it drain. Dissolve, for each pound of cotton, half an ounce of verdigris, or of blue vitriol, pour it into the liquor, stir well, and turn in the cotton as before, wring out, and dry in the shade. By adding or diminishing the logwood and fustic, any shade of green may be obtained.

To colour cotton a permanent olive.

It is not requisite that the cotton be bleached for this colour, but it must be well cleansed. To each pound of cotton, take three quarts of water, one ounce of argol, one ounce and a half of copperas, half an ounce of sugar of lead, and two ounces of blue vitriol: dissolve these together in the warm water; when dissolved, add one ounce of pounded whiting, a little at a time; take off the clear liquor, and turn in the cotton, work well, wring out, and turn in again, and let it lie all night; in the morning wring out, wash and dry. Boil for each pound of cotton, one pound of fustic, turn in the cotton, wring out, wash and dry. It is now finished, but if wanted darker, a little sumach will deepen the colour. It may be made lighter or darker, by adding or diminishing the copperas. If the drugs are dissolved in logwood water, the olive will be greenish.

To colour cotton a cheap and common olive.

For this colour, the cotton is began and worked exactly the same as for chocolate; but, instead of brazilletto, you must give it fustic liquor, in which work it well. For a greenish olive, dissolve for each pound of cotton, one ounce of alum; for a yellow olive, half an ounce of blue vitriol; if for a very green olive, add a little logwood liquor; when it has been well worked, wring out on a pin, and give, for each pound, half an ounce of blue vitriol; let it lie in this for half an hour, turning it now and then, wring out, and dry.

To colour silk green.

To colour silk a permanent green, it is previously yellowed with weld and alum, and made to the pattern wanted in a blue vat—either the woad or ash vat will answer, but the ash vat is generally used.

For a Saxon green on silk.

Wash out of soap-suds, and stick up. Boil ground green ebony in a copper vessel, strain off through a tub into a sieve, add chymic to the colour wanted—to be used with very little heat—wash twice in cold water, wring out, hang up and dry.

For a handsome green on silk, for ten pounds.

Take two pounds of alum, and four pounds of quercitron-bark. Dissolve in a kettle, with eight buckets of water, two pounds of alum; then pour it into a tub, and set it by until wanted.

While engaged in preparing the above solution, the silk must be coloured in the vat, to a handsome light blue; and, after being rinsed in a stream, wring out, and steep it in the abovementioned alum liquor; work it well therein for two hours, then take it out, wring, and lay it by wet for further use.

Lastly, put four pounds of quercitron-bark in a kettle with eight buckets of water, boil it well for three-quarters of an hour, and pour the liquor through a sieve into a tub.

Pour into the quercitron tub as much chymic as will be necessary to produce the required green, and stir the whole well. Steep the silk in this liquor, work it well therein for half an hour, then take it out, wring, and dry.

If the green is not sufficiently vivid, add a small quantity of turmeric to the yellow liquor.

The silk must not be dyed too deep a blue in the vat, as it is very difficult to make a handsome green on a deep blue. The blue should be of a light shade, and the green regulated by adding more or less of the chymic.

For a green with weld.

The boiling of the silk, the same as for common colours. After which, it must be well alumed, then rinsed, and distributed in hanks of four or five ounces. Make a strong decoction of weld, so as to give a good lemon colour. The silk is to be worked in the weld bath, till it has attained a sufficient body.

When the yellow is sufficiently strong and even, the silk is to be wrung, washed in a stream, and beetled. The silk is then to be dressed, divided into hanks suitable for the vat, then steeped, one after another, in the blue vat, and, finally, wrung and dried quickly and with care.

For deeper greens of this shade, add a portion of logwood, or of young fustic, to the weld.

For very deep greens, such as duck and bottle greens, add a little copperas.

To colour silk a dark olive.

Boil with coloured soap, and wash out well; alum, and wash well; put into clear warm water half a ladle of strong fustic liquor, the same quantity of strong logwood liquor, give the silk a few turns in this, and it will be a good olive. If wanted greener, use a little blue vitriol, wring out and lather. When the olive is wanted of a brown hue, it will do without a lather.

Having given an assortment of recipes for such colours as are the product of blue and yellow, we shall now proceed to that class of colours that are the product of yellow and red, which will include scarlets, buffs, oranges, auroras, wine colours, and a certain class of browns, &c., for which recipes will be given in the order they are here mentioned.

Of scarlet on woollen.

I have already given directions for preparing the tin liquor. Those who are desirous of having their colours uniformly of the same brilliant hue, must be particular in following one uniform mode of preparing their tin liquor; for the least variation in this particular, will make a sensible difference in the colour.

I shall give two recipes for producing scarlets, from my father's practice; one as it was done thirty years since, and the other of modern date. A third will be given, called Nash's scarlet. The recipes will be given for a certain number of yards of broadcloth, each yard weighing about one pound five ounces. I have already described the kind of cochineal that must be used to produce the best colours.

It will be necessary to give directions for the workmanship, before giving recipes for dying.

In dying scarlet, the furnace, if of copper or brass, must be kept very bright and clean. The same attention to clean vessels, must be observed in all cases where bright and delicate colours are required. If the vessel be of block-tin, the liquor may be permitted to remain in the furnace from one day to another; but when of copper or brass, it must be emptied every night, scoured quite clean, and fresh liquor made the succeeding day. This direction must be observed for all colours where solutions of tin are used, as well as for every other delicate colour.

A willow basket, such as I have before described, is used in all these colours. It is also necessary to cover the curb with clean white canvass, to prevent the goods from receiving any stain from the curb. The canvass should be secured to the top of the basket, and hang over the outside of the curb against the furnace, six or nine inches. The reel should be made of clear white pine, free from knots, and the broading and stopping sticks should be of dry white ash, without bark. The cloth, after having run its proper time in the furnace, should be rapidly wound up on the reel, and immediately thrown off into a back of cold spring-water. The back should be of an oval form, about three feet wide in the centre, as long as the cloth is wide, and made of some clear white wood that will not impart any stain to the cloth. The cloth is moved rapidly over the reel all the time it is in the furnace, and must be kept well open by the broadsmen. The liquor is brought to boil as soon as possible after the cloth is entered, and kept boiling rapidly until the colour is finished. When taken out, it is immediately streamed, as before directed, until quite clean, and tentered as soon after as possible.

Before a new liquor begins to boil, and prior to any thing being added to it, throw into the furnace one pint of tin liquor, and two or three quarts of wheat bran; bring the liquor to boil, which will cause the bran to rise to the top, let this be scummed off clean with a fine sieve, and the liquor will be ready for use.

The cream of tartar, and other drugs used for this colour, should be ground or pounded very fine.

For dying sixteen pounds of woollen a bright scarlet.

Use for boiling, half a pound of clear pure alum, six ounces of turmeric, six ounces of cream of tartar, one pint of tin liquor, (nitro-muriate of tin,) and three ounces and a half of cochineal.

The alum and tartar to be first boiled about five minutes, then the solution of tin to be added and boiled two minutes, then add the turmeric and cochineal, and boil ten minutes. Cool the liquor down, stir well, and enter the cloth rapidly; put on the fire, and bring the liquor to boil as soon as possible. Keep it rapidly boiling for two hours, then cool the liquor down, wind the cloth up on the reel, and throw it out into the back, as before mentioned; then let the cloth be well streamed, and while that is doing, add to the boiling liquor, one-quarter of a pound of cream of tartar, three-quarters of a pound of cochineal, and one pint of tin liquor. Boil the cream of tartar and tin liquor four or five minutes, put in the cochineal and boil five minutes; cool down, stir well, and enter the cloth, taking care to keep it in rapid motion, and well opened, all the time of going; boil for thirty or forty minutes, cool down, and throw out into the back, as before. The girt-web has now to be taken off the lists, the cloth streamed till thoroughly cleaned, and then tentered as soon as possible.

Scarlets, dyed according to the last recipe, were rich and full bodied, but not of that fine flame colour which is required by the fashion of the present day. When alum is used with cochineal, it increases the body of the colour, and gives it a blue tint, approaching to a pink colour.

For dying sixteen pounds of cloth a fine flame coloured scarlet.

For boiling, use ten ounces of cream of tartar, four ounces of turmeric, one pint and a quarter of tin liquor, and four ounces of cochineal.

Put these ingredients into the liquor, successively, as directed for the above recipe, and when the last is added, boil ten minutes, cool down, stir well, and throw in the cloth rapidly; boil two hours, cool down, and heave out, as before directed. Let the cloth be well streamed, and while that is doing, bring the liquor on to a boil, and add for the finishing, ten ounces of cream of tartar, four ounces of turmeric, one pint and a quarter of tin liquor, and one pound and a quarter of cochineal.

Put the ingredients in as directed for the boiling, cool down, stir well, throw in the cloth, and boil rapidly from thirty minutes to one hour, according to the colour wanted; then throw out into a back of water, and proceed as before.

A manufacturer, of the name of Nash, became celebrated for dying a scarlet, and a colour has taken its name from him, being called Nash's scarlet. The principal difference, however, between his colour and others is, that the cloth dyed by him was well grounded, the colour having completely penetrated through the thread of the cloth; this advantage was more the result of a peculiar mode of making the goods, than of any superiority in the dying. The warp, as I have been informed, was spun with as little twist as would answer for weaving, and the filling as loose as could be spun so as to follow the shuttle.

For dying a Nash scarlet, on two pieces of thirty-two yards each, weighing ninety-six pounds.

This colour has two boilings before the finishing operation. For the first boiling, use one pound and a half of cream of tartar, two quarts of tin liquor, one pound and a half of fine argol, one pound of turmeric, and one pound of cochineal.

Boil the ingredients as before, cool down, throw in the cloth, and boil one hour. It has to be boiled a second time without streaming, only previously cooling the cloth by throwing it backwards and forwards.

For the second boiling, use eight ounces of turmeric, two quarts of tin liquor, three pounds of cream of tartar, and one pound of cochineal.

Proceed as before, boil two hours, take out, and stream well; then use, for finishing, five pounds of cochineal, three quarts of tin liquor, and two pounds of cream of tartar.

Throw in the cloth as before, and boil till done, which will be in thirty or forty minutes. This is a strong rich colour, and being boiled two hours in the second process, and the yarn having been spun loose, is so much better grounded than scarlets commonly are, as to give the colour the appearance of great intensity.

It is usual, in all establishments where scarlet dying is carried on upon a large scale, to colour twenty or thirty pieces in one day, and by this means much expense is saved. If a furnace is brought on early in the morning, some pieces are boiled, or prepared, in the first operation, which prepares the liquor for finishing—for a bright scarlet never can be made in a fresh liquor. Three or four lots that were boiled a day or two before, are then finished in the same liquor, and afterward three or four lots of white pieces are boiled. The first lot boiled after finishing, needs no cochineal; the others follow it, until the whole of this valuable drug is taken out of the finishing liquor; tin liquor, cream of tartar, and turmeric, are added in the quantities prescribed, but no cochineal, except for the second boiling; the third and fourth lots are called runs, and are boiled a second time. Sometimes a whole day is employed in boiling, when the practice prescribed in the recipes given for boiling is followed, except for the two last, in which the cochineal is left out.

To colour scarlet with the colouring matter of the stick lac, known in the market by the name of lac-dye.—See lac-reds, &c. pp. 87—90.

As cotton is never dyed scarlet, we shall proceed with silk.

Boil twenty pounds of silk, in a liquor with four pounds of black soap, for three hours. Take any quantity of annatto, ground fine—to each pound, add four ounces of pearlash; these are to be ground together in a copper pan, with copper balls, after the same manner as indigo. Bring your water to a boil, take of the annatto liquor one or two bowls, which add to the boiling water, put your silk in at a spring heat, and it will soon become a good orange. Take the silk out of the furnace, hang it up over it, so that the liquor which drains off may run into the furnace. When drained, wash the silk in four warm waters, and hang up six knots on each stick. Take of the tin liquor one pint, add it to water of a good heat, and this will be sufficient for ten pounds of silk; give a few turns, wash out and stick up. Then take one pound and a half of well-ground cochineal, put it into a bell-tub, and fill it up with boiling water; give the silk a few turns in this, and it will come out a fine scarlet.

To dye a mock-scarlet on silk.

Orange the same as for real scarlet, wash and stick up as before. Add some strong alum liquor to boiling water, turn the orange in this liquor for three hours, wash in two cold waters and stick up. Take of a liquor made from Brazil wood, previously boiled, two pails, soak sumach in a tub, and strain off a ladleful. These two will finish off the orange a good mock-scarlet. When dark enough, wring out and dry.

Recipes for buff.

The yellow for dying of buff is obtained from old fustic. The best sticks used are such as are new and sound, being selected for this purpose. The outside of the logs is split off, and the heart of the wood is ground very fine, and sold to the dyer at double the usual price, for dying of buff and other fine colours. A good buff dyer is more rare than a good scarlet dyer, and goods for this colour are sent from London and other parts of England, a distance of more than two hundred miles, to a dyer in the west of England who is celebrated for dying this colour. It would be supposed that a colour requiring only fustic yellow, and a little best madder, could be well done any where, did not experience prove it to be erroneous.

The cloth intended for buff, must be examined, spotted and cleaned the same as for scarlet, and that which is not perfectly free from spots and stains, cannot be used for this colour, as the least defect will be seen when finished. Cloth for buff must be finished shearing before it is dyed.

The same precautions, to keep the goods from coming in contact with the metal, and curb of the furnace, are used in this colour as in the scarlet dye. Buff is more liable than any other colour to become spotted, when it comes in contact with any material that can impart a stain to it; the utmost caution, therefore, should be used to prevent this.

Recipe for twenty-seven pounds of fine cloth.

Use one pound of argol, one pound of alum, two pounds of tin liquor, half a pound of ground fustic, and one ounce of best crop madder.

Boil the ingredients as directed for scarlet, heave in the goods, keep them rapidly in motion, and boil until of the desired colour. If this colour should not be strong enough, use more fustic and madder; if too red, use more fustic and less madder; if not red enough, use more madder and less fustic. By these means, any body or shade may be obtained.

I have never known wool to be dyed buff for cloth of one colour, but as it is often made for mixtures and striped goods, such as vest patterns, &c., I shall add a recipe to produce it.

For a buff on one hundred and twenty pounds of wool.

Take fourteen pounds of weld, boil it half an hour, take out the weld, stir well and heave in the wool; boil it two hours and land; add to the liquor one pound of alum, cool down, heave in the wool, boil it one hour, land and wash.

This will be a pale yellow buff, the shade of which may be changed to a red hue, by using a small quantity of madder.

Buffs may be coloured on wool with fustic and madder, as it is done on cloth, leaving out the greater part of the tin liquor, which, when applied strong, makes the wool harsh and difficult to spin.

For a buff colour on cotton.

Cotton for buff should be bleached. For each pound of cotton take one quart of iron liquor, and four of water; put it into a copper or brass vessel, add to the iron liquor six ounces of copperas, and one ounce of sugar of lead; when you can bear the hand in the liquor, turn in the cotton, work it well, squeeze out, and turn it in again; then let it lay all night, taking care that the cotton be completely covered with the liquor. In the morning, wring it out and dry quick, spreading it well on the drying poles. Take fresh made lime-water, turn in the cotton as quick as possible, and wet it completely. When raised to the colour wanted, wring out, wash, and it is finished. If the colour should not be full enough, put in more iron liquor and copperas, and less water. If it be too strong, put in less of those ingredients, and more water; by which means a great variety of shades may be obtained.

It would answer a much better purpose, after the cotton has received the iron liquor, and has been dryed, to run it through a chlorine water, as described for black and Prussian blue. Two pounds of bleaching powders, first stirred into four gallons of water, and when settled clear, to pour the liquor into a hogshead of water, will be all that is wanted.

For a salmon colour on cotton.

The cotton must be white—prepare as usual. Boil for each pound of cotton, one ounce of cream of tartar, for fifteen or twenty minutes, add to it water enough to turn in the cotton, work it for half an hour, and wring out. Then turn it into a liquor prepared the same as for orange, only about half the strength, work quick and even; when well worked, wring out evenly, and turn it into the cream of tartar liquor again, work quick until it receives a nice salmon colour, wring out and dry in a warm room.

For a brimstone, or straw colour, on cotton.

The cotton must be white. To each pound, dissolve one ounce of alum, turn in several times, and then turn down for half an hour, wring out gently and even. It must now have a clear and slender fustic liquor, turn it over quick at first, and turn it into the alum liquor again ten or twelve times, wring out evenly, dry in a stove in the winter, and in the shade in the summer.

For a straw colour on silk.

Boil until white, wash, wring out and stick up. Prepare a strong ebony liquor by well boiling, take a ladleful of this liquor, which will dye about ten pounds, give it five or six turns in this when diluted with water, and if the ebony does not work green enough, put into the liquor a very small quantity of chymic, and finish by stoving with sulphur.

A nankeen colour on ten pounds of silk.

Take two pounds of fine galls, one ounce and a half of annatto, four ounces of potash, and half a pound of soap.

Put one pound of finely-pounded galls in a kettle of eight buckets of water, and boil it about ten minutes, then take out the liquor, and run it through a sieve into a vat.

While thus employed, let half a pound of soap be dissolved in a bucket of warm water, and pour the solution into the liquor of the galls.

Then put into a crock of water one ounce of annatto, and four ounces of potash; boil for half an hour, add one half of it to the liquor of the galls in the vat, and stir the whole well; steep the silk in the liquor, and work it well therein for a quarter of an hour. Examine the silk, and should it not have the necessary redness, add as much of the annatto liquor to it as you may deem necessary, to give the colour the desired tint. Then put the silk in again, and work it well for a quarter of an hour, take it out, rinse and dry it.

The nankeen coloured silk must not remain long without being rinsed, as this would create stains in it.

Recipes for orange and aurora.

When woollen yarn and cloth are dyed orange or aurora, they are usually boiled in a spent liquor, after scarlet or buff.

For sixteen pounds of cloth for a fine orange. Boil in an old buff liquor, two pounds of young fustic chips, (Venice sumach,) three-quarters of a pound of best madder, one pound of cream of tartar, three-eighths of a pint of tin liquor, and half an ounce of cochineal.

The chips to be well boiled before the other ingredients are added; after boiling the other wares for a few minutes, cool the liquor down, stir well, throw in the cloth, and boil till up to the pattern.

For an orange on sixty pounds of fine cloth, in a spent scarlet liquor.

Use eight pounds of young fustic chips, four pounds of cream of tartar, three pounds of best madder, half an ounce of cochineal, and one pint of tin liquor. Boil the chips, and proceed as before.

Auroras are dyed the same as oranges, except with less madder, and an additional quantity of cochineal. Some auroras approach very nearly to the scarlet colour, having a greater body of yellow.

Oranges and auroras, when done in a liquor prepared on purpose, require more cream of tartar, tin liquor, and cochineal, than is prescribed in the foregoing recipes.

For a common orange on four pieces of flannel.

For the boiling, use one pint of tin liquor, and two pounds of argol. Give a body with young fustic, and redden to pattern with madder of the first quality.

Wool is seldom dyed of an orange colour, but as it may be wanted sometimes for mixtures, I will give the only recipe my collection affords.

For an orange on nineteen pounds of wool.

Take three pounds of alum, boil it one hour, cool down, stir, throw in the wool, boil two hours, and let it lie all night. In the morning wash it, and finish in a fresh liquor, with ten pounds of weld, and three pounds of madder; boil it seven or ten minutes, and land.

For an orange on cotton.

The cotton for this colour should be white. To each pound of cotton take two ounces of annatto, grind with water in a brass kettle, as indigo is ground, wash it out into another kettle, or pan, and add an equal quantity of pearlash; boil for half an hour, turn in the cotton, wring out, and dry in a stove, or in the shade; the more of annatto is used, the richer and finer will be the colour. The liquor should not be thrown away after the working, but used with another quantity, by adding more of the material to the old liquor after boiling, which will be a saving of one-third.

Chrome-orange on cotton.

For one hundred pounds of cotton yarn, take twenty-four pounds of nitrate of lead, dissolve in fifty gallons of water, then take eight pounds of bichromate of potash, which dissolve in six gallons of water. Make up your tubs in the same way as directed for yellow. Make up another tub of lime-water, and use the lead and chrome liquors as directed for yellow, with the same proportions. Work the yarn, in ten pound bundles, first in the lead, then in the lime-water, again through the lead, then in the lime-water, and again through the lead; enter your yarn into the chrome tub, afterward through the lead, and then through the chrome again. Have a furnace filled with lime-water, brought to a boiling heat, and enter your yarn into it, bundle after bundle, always adding fresh lime-water for every bundle; wash out in cold water, and it is finished.

All the tubs, both in the yellow and orange, are warmed to 100° Fahrenheit.

The sediment of the chrome tubs is sold to painters; the liquors, after dying, are thrown into hogsheads to settle.

Fawns, of a very delicate shade, are made by preparing the yarn with sumach, and finishing in the liquor from the hogsheads.

To colour silk an orange.

Orange colour is obtained with soda and annatto, and by working in this liquor until the desired colour is complete.

For a deep orange yellow on ten pounds of silk.

Take one pound and a quarter of alum, eight pounds of safflower, and a quarter of a pound of alum. Dissolve the alum in a kettle containing ten buckets of water; then pour the solution into a tub, steep the silk in it, work it well therein for half an hour, wring it, lay it by in its wet state, for further use, and throw away the solution of alum. Put ten buckets of fresh water into a kettle, add eight pounds of safflower, and a quarter of a pound of alum; boil for half an hour, run the decoction through a sieve into a tub, steep the silk in the liquor, work it well therein for a quarter of an hour, wring out, and dry it; fix it on the wringing post, wring and beat it well, and it is finished.

With the remains of the above liquor, a pale yellow may be obtained.

To dye cinnamon colours.

For fifty pounds of fine cloth, for a bright cinnamon, use seven pounds and a half of alum, one pound and a half of argol, and nine pounds of redwood. Boil the wares two hours, cool down, stir, throw in the cloth, and boil one hour.

For a darker cinnamon, on the same weight of cloth, use seven pounds of alum, two pounds of argol, six pounds of fustic, ten pounds of barwood, and eight pounds of redwood. Boil the wares two hours, heave in the cloth, and boil as before.

The hue and body of cinnamon may be varied, by using more or less of fustic, and the other dye-woods.

Cloth, for cinnamon, is oftentimes prepared with umbro madder, alum, and argol, and then finished with fustic, redwood and barwood in another liquor, and these are the best and most permanent colours.

To dye wool cinnamon colours.

For one hundred and twenty-five pounds of wool, use fifty pounds of fustic, sixty pounds of red sanders, and six pounds of madder. Boil the wares two hours, cool down, heave in the wool, boil it two hours, cool down, and strew over four pounds and a half of ground cream of tartar, and four pounds and a half of alum; boil an hour, and let lie all night.

For a cinnamon of a fuller colour, and more on the red.

For one hundred and twenty pounds of wool, use twenty-four pounds of fustic, and forty-two pounds of red sanders.

Boil the dye-wares and the wool as for the last, then strew over fifteen pounds of alum, boil one hour, and let it lie in all night; wash the wool the next morning, and finish in a fresh liquor, with thirty pounds of ambro madder. This is a very rich colour, and is never applied but on fine goods.

For a very bright cinnamon on twenty pounds of wool.

For the boiling, use one ounce and a half of nutgalls, five pounds of fustic, and four pounds of red sanders.

Proceed as before directed for boiling. For saddening, use one ounce and a quarter of copperas, and two ounces of alum, boil one hour, and let lie in all night.

The two following recipes are for two lots of very bright cinnamon, done in succession in the same liquor.

For ninety-three pounds of wool, use forty-five pounds of barwood, twenty-seven pounds of fustic, and five pounds of alum.

Boil the wares two hours, and the wool twenty minutes, land it, and then add to the same liquor, for a second lot of wool of eighty pounds, twenty-eight pounds of barwood, and seven pounds of fustic. Boil the wares and wool as before, cool down, and strew over it six pounds of alum, boil half an hour, and let lie in all night.

Cinnamon on cotton is dyed by first colouring it yellow, and then red, as given in the recipes for those colours. If the colour should not prove bright enough, work it in soapsuds, wring out, dry, and it is finished.

To dye a cinnamon on ten pounds of silk.

Take half a pound of nutgalls, two pounds and a half of alum, half a pound of argol, and four pounds of madder.

Put into a kettle eight buckets of water and the nutgalls, let it boil fifteen minutes, run it through a sieve into a vat, steep the silk in this decoction, and work it well therein for about two hours, after which, take it out, rinse, dry it, and then alum it. Put into a kettle ten buckets of water, add the madder, and work the silk well in this liquor until it begins to boil, then take it out, rinse, and dry it. Lastly: dye it in a strong yellow liquor, and it will be a good bright cinnamon. The yellow may be used with the madder, which will save time and fuel.

To dye a beautiful cinnamon on both cotton and silk, by a new process.

Give the goods as much colour, from a solution of blue vitriol, as it will take up, then run it through lime-water. This will make a beautiful sky-blue, of much durability. It has now to be run through a solution of prussiate of potash, when it will be a beautiful brown.

To dye fawn colours on woollens.

For sixty pounds of cloth, use four pounds of alum, two pounds of cream of tartar, four ounces of logwood, one pound of peachwood, and one pound of fustic.

Boil the ingredients two hours, and the cloth two, heave out, and sadden to pattern with copperas.

For a fawn on sixteen pounds of wool.

For the boiling, use five ounces of argol, nine ounces of redwood, three ounces of fustic, seven-eighths of an ounce of Brazil wood, and seven-eighths of an ounce of logwood.

Boil the ingredients two hours, and the wool two, cool down the liquor, and sadden with three ounces of alum, and six ounces of copperas; boil half an hour, and if dark enough, land, if not, let it lie in all night.

For a fawn on sixty pounds of wool, not quite so red as the last.

For the boiling, use one pound of weld, one-quarter of a pound of ground fustic, seven pounds of umbro madder, two pounds of best argol, half a pound of tin liquor, and one-quarter of a pound of alum.

Boil the ingredients one hour, and the wool one hour; cool down and strew over two ounces of copperas, and one ounce of pearlash; boil half an hour, fill up with cold water, and let lie all night.

For a fawn on sixteen pounds of wool, still less on the red hue.

For the boiling, use half a pound of weld, half an ounce of fustic, half an ounce of logwood, seven ounces of best madder, and two ounces of argol.

Boil the ingredients one hour, cool down, heave in the wool, and let it be two hours in coming to a boil; then boil two hours, and cool down; strew over one ounce of alum, boil one-quarter of an hour, cool down again and strew on one ounce and a quarter of copperas, and half an ounce of pearlash; boil half an hour, cool down, run off the liquor and wash.

To dye silk a fawn colour.

Prepare the same as for drab, stick up three on each stick, strike a lather with hot suds, put into it a little annatto, which will make a buff, wash out in two warm waters, and stick up; take a warm liquor, put into it two pails of spent orchille liquor, half a ladle of fustic liquor, and a ladle of argol liquor; stir well, take a piece of the buff silk, dip in, and if not dark enough, add a little more of each material: the argol raises the orchille—some use oil of vitriol. A ladle holds from four to five quarts.

To dye browns on woollens, such colours as have no blue in their composition, being compounded of red and yellow.

For a brown on one piece of cloth, weighing forty-eight pounds, use seven pounds of alum, nine pounds of logwood, and two pounds of argol.

Boil the wares two hours, run up with cold water so as to have in quite cool, boil the goods two hours, heave them out, and cool by throwing; then roll the cloth up and let lay until the next day. Prepare a fresh liquor with seven pounds of alum, twelve pounds of barwood, and one pound of pearlash.

Boil the wares two hours, run up, heave in the cloth, bring the liquor to a spring heat, but not to boil out; run at that heat for one hour, and it is finished.

It is usual in English dye-houses to boil a number of cloths in the preparation liquor, and finish them afterward in the fresh liquor, successively.

For a very dark rich brown on sixteen pounds of wool.

For the boiling, use six pounds and three-quarters of fustic, six pounds and three-quarters of red sanders, and one pound and three-quarters of madder.

Boil the wares two hours, run up, heave in the wool and boil it two hours, cool down and sadden with one-quarter of a pound of copperas, and five ounces of alum; boil half an hour, and let lie in all night.

For a darker and richer brown on one hundred and twenty pounds of wool.

For the boiling, use one pound and a half of powdered nutgalls, thirty pounds of redwood, and twelve pounds of red sanders.

Boil the wares and wool as before, sadden with one pound and a half of copperas, boil one hour, and let lie in all night.

For a lighter brown than either of the above, for sixty-eight pounds of wool.

For the boiling, use two pounds and one-third of nutgalls, eighteen pounds of red sanders, and four pounds and a half of peachwood.

Boil the ingredients two hours, the wool two, run up, and add three-eighths of a pound of copperas; boil one-quarter of an hour, cool down again, and strew over three pounds of alum; boil one hour, and let lie in all night.

For a very dark brown for one hundred and forty pounds of wool.

For the boiling, use seventy pounds of chipped fustic, seventeen pounds and a half of barwood, and four pounds of logwood.

Boil the dye-wares two hours, the wool two, cool down and sadden with three pounds of copperas, and one pound and a half of alum; boil one hour, and let lie in all night.

For a very dark rich brown, for sixteen pounds of wool—this is a claret brown.

For the boiling, use fourteen pounds of barwood. Boil the dye-wares two hours, run up, heave in the wool and boil it two hours, cool down and sadden with twelve ounces of copperas, boil one hour, and let lie in all night.

For a rich copper brown for one hundred and eighty pounds of wool.

For the boiling, use sixty pounds of fustic, and eighty pounds of barwood.

Boil the dye-wares two hours, run up, heave in the wool, and boil it three hours; cool down and sadden with seven pounds of copperas, and three pounds of alum, boil one hour, and let lie in all night.

For a very dark rich brown for sixteen pounds of wool.

For the boiling, use ten pounds of chipped fustic, six pounds of barwood, seven pounds of peachwood, and half a pound of logwood.

Boil the wares as usual, run up, boil the wool three hours, cool down and sadden with ten ounces of copperas; boil one hour, and let lie in all night.

For a very rich brown, lighter than the preceding, for sixteen pounds of wool.

For the boiling, use six pounds of chipped fustic, three pounds of barwood, two pounds of redwood, and two pounds of logwood.

The wares to boil two hours, run up, enter the wool and boil it three hours; cool down and sadden with four ounces of alum, two ounces of argol, and two ounces of copperas; boil three hours, and let lie in all night.

For a rich brown, yellower than the last, for three hundred pounds of wool.

For the boiling, use one hundred and eighty pounds of chipped fustic, ninety pounds of weld, ten pounds of common madder, five pounds of redwood, and two pounds of logwood.

Wares to boil as usual, run up, enter the wool, and boil it three hours; cool down and sadden with nine pounds of alum, ten pounds of redwood, ten pounds of barwood, and three pounds of copperas; boil one hour and a half, and let lie in all night.

For a rich brown, between the two last, for three hundred and fifty pounds of wool.

For the boiling, use three hundred and fifty pounds of chipped fustic, eighty-four pounds of common madder, and three pounds of argol.

Wares to boil as usual, run up, heave in the wool, and boil it two hours; cool down and sadden with three pounds of alum, three pounds of copperas, and fifteen pounds of barwood; boil two hours, and let lie in all night.

The three last recipes afford remarkably rich browns.

For a rich claret brown, approaching to a plum colour, for sixteen pounds of wool.

Use for the boiling, eighteen pounds of barwood, and two pounds of logwood.

Boil the wares as usual, run up, heave in the wool, and boil it two hours; cool down and sadden with ten ounces of argol, and ten ounces of copperas; boil two hours, and let lie in all night.

For a light rich red brown for one hundred and twenty pounds of wool.

For the boiling, use forty pounds of fustic, seven pounds of red sanders, and six pounds of madder.

Boil the wares as usual, run up, heave in the wool, and boil it two hours; cool down and sadden with one pound of copperas, two pounds of alum, and twelve ounces of logwood; boil one or two hours, and let lie in all night.

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For a lighter brown than the above, on one hundred and twenty pounds of wool.

For the boiling, use thirty-five pounds of fustic, three pounds of red sanders, and eight pounds of madder.

Boil the wares three hours, proceed as usual, and sadden with twelve ounces of copperas, and three pounds of alum; boil forty-five minutes, and let lie in all night.

For a deep rich brown for one hundred and twenty pounds of wool.

For the boiling, use forty pounds of fustic, eight pounds of madder and fourteen pounds of red sanders.

Boil the wares two hours, run up, heave in the wool, and boil three hours; sadden with two pounds and four ounces of copperas, and one pound and eight ounces of alum; boil one hour, and let lie in all night.

For a bright yellow brown for one hundred and twenty pounds of wool.

For the boiling, use twenty-six pounds of fustic, four pounds of red sanders, and ten pounds of madder.

Boil as usual, and sadden with seventeen ounces of copperas, and two pounds of alum; boil one hour, and let lie all night.

For a strong red brown on one hundred and twenty pounds of wool.

For the boiling, use thirty pounds of fustic, and twenty pounds of red sanders.

Boil as usual, and sadden with twenty ounces of copperas; boil one hour, and let lie all night.

For a light red brown on one hundred and twenty-two pounds of wool.

For the boiling, use eight ounces of nutgalls, twenty-eight pounds of fustic, and twenty pounds of red sanders.

Boil as usual, and sadden with seven ounces of copperas, and twelve ounces of alum; boil one hour, and let lie in all night.

For a light brilliant brown for one hundred and sixty-eight pounds of wool.

For the boiling, use seventy pounds of fustic, ten pounds of red sanders, and six pounds of fine madder.

Boil as usual, and sadden with four ounces of copperas, and three pounds and three-quarters of alum; boil one hour, and let lie all night.

For a light yellow brown for one hundred and sixty-eight pounds of wool.

For the boiling, use seventy pounds of fustic, and two pounds and eight ounces of logwood.

Boil as usual, and sadden with one pound of copperas, and three pounds of alum; boil one hour, and let lie in all night.

The light browns are mostly used for pantaloons and mixtures.

The two following recipes are for red browns for mixtures. The first one is for a dead red brown, and the second for a bright red brown inclining to yellow.

The first is for eighty pounds of wool.

For the boiling, use eight ounces of nutgalls, eight pounds of madder, and sixteen pounds of red sanders.

Boil as usual, and sadden with four ounces of copperas; boil one hour, and let lie in all night.

The second is for two hundred and thirty pounds of wool.

For the boiling, use thirty-six pounds of alum, and one hundred and sixty pounds of fustic.

Boil the wool two hours, land and wash.

Prepare a fresh liquor, and give it twenty-eight pounds of fine madder; boil one hour, and let lie in all night.

For a very deep and rich claret, for two hundred and sixty pounds of wool.

For the boiling, use two hundred and eighty pounds of barwood, eight pounds of Brazil wood, and six pounds of logwood.

Boil as usual, and sadden with six pounds of copperas; boil one hour, and let lie in all night.

Recipes for olive browns.

Olive browns are a combination of the three primitive colours, red, blue, and yellow. There are two kinds of olive, the brown olive, and the green olive. The brown olive has more red than the green olive in its composition, and not so much blue. The blue of the green olive may be made either with indigo or logwood.

For an olive brown, for two hundred and fifty pounds of wool.

For the boiling, use two hundred pounds of chipped fustic, seventy pounds of weld, eight pounds of redwood, ten pounds of mull madder, and two pounds of logwood. The wares to boil as usual, heave in the wool, and boil three hours; cool down, and sadden with six pounds of alum, and three pounds of copperas; boil one hour and a half, and let it lie in all night.

For a very dark olive, on sixteen pounds of wool.

For the boiling, use eleven pounds of chipped fustic, one pound and a half of logwood, ten ounces of common madder, and nine ounces of best madder.

Wares to boil as usual, run up, throw in the wool, and boil it three hours; cool down, and sadden with ten ounces of copperas, and nine ounces of alum; boil one hour, and let lie in all night.

For a deep olive, on two hundred and twenty pounds of wool, considerably on the green hue.

For the boiling, use one hundred and thirty pounds of fustic, sixteen pounds of logwood, and six pounds of barwood.

Wares to boil as usual, boil the wool two hours, and sadden with six pounds of copperas, and two pounds of alum; boil one hour, and let it lie in all night.

For a light olive, on thirty-two pounds of wool, more on the yellow than that of the last recipe.

For the boiling, use twenty-one pounds of fustic, one pound and nine ounces of logwood, one pound and nine ounces of redwood, two pounds and six ounces of madder, and six ounces of argol.

Wares to boil as usual, boil the wool two hours, and sadden with nine ounces of copperas, and three ounces of alum; boil one hour, and let lie in all night.

For a very deep rich olive brown, for three hundred and sixty pounds of wool.

For the boiling, use two hundred and sixteen pounds of fustic, eighteen pounds of madder, eighteen pounds of redwood, eighteen pounds of logwood, and four pounds of argol.

Wares to boil as usual, boil the wool two hours, and sadden with nineteen pounds of copperas, and five pounds of alum.

There are a number of colours, having a yellow hue, that have no yellow dye in them. They are mostly made on cloth, and are very rich and beautiful, being partly made with cochineal, rendered more or less yellow by the action of the tartar and the tin liquor. I shall give recipes for these in this place, because they come nearer to colours made of red and yellow, than to any other class of colours.

For a rich wine colour, for forty-eight pounds of fine cloth.

For the boiling, use five pounds of alum, three pounds of cream of tartar, four pounds of Brazil wood, one pound of cochineal, and two quarts of tin liquor.

The wares to boil one hour, the liquor cooled down quite low, the cloth to be entered rapidly, and kept in quick motion all the time of working—to be boiled two hours.

Prepare a fresh liquor, with six pounds of Brazil wood, one pound and a half of pearlash, and one pint and a half of tin liquor.

The wares to boil one hour, cool down, and run the cloth until of the colour wanted.

By varying the proportion of the Brazil wood, and by increasing or lessening the pearlash, a great variety of these colours may be produced.

For a rich wine colour, on one hundred and twenty pounds of wool.

For the boiling, use twenty pounds of alum, twenty pounds of cream of tartar, and two pounds and a quarter of cochineal.

Boil the alum and tartar half an hour, then the cochineal fifteen minutes, run up, throw in the wool, and boil two hours; cool down, land the wool, and bring on a fresh liquor. Put into the fresh liquor half a bushel of bran, and when the bran rises, scum it off clean with a fine sieve; then put in forty pounds of the best madder, boil two or three minutes, run up, throw in the wool, and boil it a quarter of an hour; let it be one hour coming up to a boil, land, and wash.

Another recipe for a rich wine colour, on the same quantity.

For the boiling, use one pound of cochineal, seven pounds and a half of Brazil wood, and twenty-five pounds of alum.

Boil the wares two hours, run up, enter the wool and boil it three hours; then sprinkle over six gallons of urine, work the wool well, and let it lie all night. Wash the wool, and finish in a fresh liquor, with seventy pounds of best madder.

To dye chocolate on cotton.

The cotton to be boiled in a liquor of nutgalls, and alumed the same as for red. Then use six ounces of alum and two ounces of copperas to each pound of cotton, wring out and dry as for red: prepare it a second time in alum and copperas, wring out and dry again—wash well and wring out; then madder it, with half a pound of madder to each pound of cotton, the same as for red, wash well, and it is finished. If not red enough, give it a small quantity of brazilletto chips; if not enough on the claret, give it a very little logwood.

Common mode of dying chocolate on cotton.

Prepare the cotton with sumach, instead of galls, sadden with two ounces of copperas to one pound of cotton, wash well, and return it into the same sumach liquor; wash well, wring out, and return it again into the copperas liquor—wash well, dry, and alum it with six ounces of alum to each pound of cotton; then proceed as directed for the last chocolate.

Third recipe for chocolate on cotton.

Give to the cotton the usual preparation; for each pound boil four ounces of sumach, turn in the cotton, squeeze out, turn in again, putting it in as open and as even as you can, and let it lie all night. In the morning wring out gently, and dissolve for each pound of cotton one ounce of copperas, turn in with the water sufficiently warm, and work for half an hour; wring out, wash well, and add some urine to the sumach liquor, turn in the cotton, and work quick for fifteen or twenty minutes, squeeze out, dissolve one ounce of copperas to each pound of cotton, and add it to the former liquor; turn in and handle well for twenty minutes, wring out and wash well. If a brown chocolate is wanted, and the sumach liquor should not be turned, put some urine to the water, and while that is doing, boil, for each pound of cotton, half a pound of brazilletto chips, (if not for a very red colour, four ounces will do,) pour in a little urine, or lime-water, while the liquor is boiling—when boiled, take off the clear liquor, and turn it in at the usual heat; when it has been well worked in this liquor, dissolve, for each pound of cotton, one ounce of alum in warm water, stir well, and turn in the cotton; let lie one hour, wring out, and turn it into the brazilletto liquor as before, wring out, dry, and it is finished.

If wanted of a blue cast, or more like purple or claret, the urine must be omitted; and, after it has been alumed the second time, add logwood liquor to the brazilletto, by which different shades of colour may be produced.

To dye brown on cotton.

Give a ground of sumach, handle well, and let it lie in the liquor all night. In the morning add, for each pound of cotton, two ounces of copperas: when well worked, wring out, and wash well; turn into the sumach liquor again for fifteen minutes, then copperas a second time without washing. Make a lime-water, with a handful of lime for each pound of cotton; put the lime into a bucket of water, stir well, let stand until clear, pour off the clear liquor, add more water to the lime, and repeat until liquor enough is obtained to work the cotton; turn in and work very quick. While this is doing, take scalding water, and put into it, for every pound of cotton, one pound of ground black-oak bark; put the bark into a tub, pour the boiling water on it, and strew into it, for each pound of cotton, half an ounce of lime; turn in the cotton, at the usual heat, for fifteen or twenty minutes, wring out, dry it, and it will be a fine brown.

The darker the colour is before turning into the lime-water, the finer and richer it will be when finished.

To dye morone on silk.

Wash the silk from boiling in soap, alum as usual for three hours, wash in two tubs of cold water, and stick up; take four or five pailfuls of Brazil liquor, pour on it water as hot as the hand can bear, turn in the silk, and handle until of the colour wanted, wring out and dry in a stove.

For a real brown, on ten pounds of silk.

Take six ounces of annatto, one pound of potash, three pounds of alum. five ounces of fine galls, one-quarter of an ounce of cream of tartar, two ounces of turmeric, and ten ounces of cochineal.

Boil a kettle with ten buckets of water, powder six ounces of annatto, and put it, together with a pound of potash, into the kettle; boil for a quarter of an hour, pour the liquor through a sieve into a tub, immerse the silk, and work it well in the liquor for two hours, then take it out, wring, and dry it. After this, pour eight buckets of fresh water into a kettle, dissolve three pounds of alum therein—then put the solution into a tub, steep the dried yellow silk, and work it well therein for three hours, then take it out, wring, and lay it by wet for further use.

Boil a kettle with eight buckets of water, put into it ten ounces of cochineal, and let it boil for about ten minutes; then cool the liquor with a bucket of water, and put into it a quarter of a pound of cream of tartar, and two ounces of turmeric, and stir the whole well; then steep the silk, previously alumed, in the liquor, work it well therein for two hours, during which time it must be kept at a continual boil. Then take it out, rinse in running water, wring, and lay it by in its wet state for further use.

This being done, dye it in a blue vat, light or dark, as you may require, or according to the pattern.

The colour may be filled up with sulphate of indigo, or with logwood, which will render it equally handsome, but not of so lasting a colour.

To dye colours compounded of red and blue.

In this class of colours are comprised, imperial blues, purples, lilacs, crimsons, pinks, mulberries, clarets, corbeaus, lavenders, &c.

To colour imperial blues, nothing more is necessary than to boil more or less of orchille and alum, and run light blues through the liquor at a boiling heat, till of the colour wanted. When the imperial is required to be red, boil the goods, before dying blue, with one-sixth its weight of cudbear.

To colour ninety pounds of fine cloth a rich purple.

Prepare the liquor by putting into it a quarter of a peck of bran, and when it rises to the surface, as it begins to boil, scum the bran off clean with a fine sieve.

For the boiling, use four pounds of cream of tartar, six pounds of alum, two quarts of tin liquor, and one pound and a half of cochineal.

Boil the alum, tartar and tin, for one hour, then the cochineal for ten minutes, run up, heave in the goods, and boil two hours.

Prepare a fresh liquor, with four pounds of alum, six pounds of Brazil wood, two quarts of tin liquor, eighteen pounds of logwood, and three pounds and a quarter of chymic.

Boil the wares two hours, run up, heave in cool, and work rapidly. Boil until finished.

The most permanent purples are made by bluing in the vat, and then filling up with a cochineal liquor. The only objection to these colours is the price, as they are usually charged as high as scarlet.

For a purple on one hundred and twenty pounds of wool.

Blue, in the woad vat, according to the body of purple required.

For the filling up, use twenty-one pounds of alum. The wool to boil in this liquor for two hours, then land, and add twenty-four pounds of cream of tartar, and four pounds of cochineal; boil the tartar one hour, then add the cochineal, and boil a quarter of an hour; cool down, heave in the wool rapidly, and boil to the colour wanted.

The wool should be well washed from the blue vat, before dying.

For a purple on sixteen pounds of wool.

Make it first a light blue, in the woad vat, wash very clean, and boil it with two pounds and a quarter of alum; land the wool, add to the liquor one pound and three-quarters of cream of tartar, and half a pound of cochineal. Boil the wool until of the colour wanted. Any shades may be obtained, by making the blues lighter or darker, and varying the proportions of the cochineal.

When darker purples are required, they may be finished in a fresh liquor, with Brazil wood and logwood.

To dye purple on cotton.

Cotton, for purple, must be well cleansed, and should be bleached. Take, for each pound, one quart of iron liquor, and four quarts of water; put this into a brass or copper kettle, add for each pound of cotton half an ounce of saltpetre, half an ounce of sal-ammoniac, and half an ounce of cream of tartar, all pounded together until fine, and kept over the fire until scalding hot; take it off the fire, and when cooled sufficiently to bear the hand in it, turn in the cotton, squeeze out, turn in again, and let lie all night; wring out in the morning, dry and wash. It must now be galled, the same as for red, allowing half a pound of galls for each pound of cotton; wring out, dry, and it is finished.

This colour may be raised with logwood liquor, but it will not stand.

To colour a common purple on cotton.

Boil and well wash the cotton; for each pound, boil half a pound of logwood, take the clear liquor, and when you can bear the hand in it, add urine, turn in the cotton for an hour, then raise it out, and put it on a pin to drain. Make a fresh liquor, by dissolving for each pound of cotton three-quarters of an ounce of alum, in as much water as will be sufficient to work the cotton, add a dish of logwood liquor, squeeze the cotton, turn in, and handle as quick as possible for two or three times; it must be worked till it becomes of a beautiful lilac. When the colour is as bright as you wish, wring out gently, wash it a little, wring it even, turn it into the logwood liquor again, and work it quick once or twice. If the liquor does not work well, add, for each pound of cotton, half an ounce of alum; when dissolved, stir well, turn in for fifteen or twenty minutes, wring out evenly, and dry in the shade.

To colour purple on silk.

For ten pounds of silk, use two ounces and a half of cochineal, ten ounces of aquafortis, one ounce and a half of tin, and one-quarter of a pound of alum.

The silk must be first coloured in a blue vat, to a half blue. This being done, take a kettle containing ten buckets of water, put into it two ounces and a half of cochineal, and boil it well for ten minutes.

Dissolve the tin in the aquafortis, pour the solution, together with the alum, into the cochineal liquor—stir the liquor well, and immerse the silk in it, and work it well for forty-five minutes, keeping gently boiling the whole time; then take it out, rinse, wring it, fix it on the wringing post, wring and beat it well.

The silk should be washed clean, before dying it in the cochineal liquor.

Those who prefer leaving out the tin liquor, may use a quarter of a pound of cream of tartar, and double the quantity of alum.

Another purple on ten pounds of silk.

Take one pound and a quarter of alum, two ounces and a half of cochineal, half a pound of tin liquor, three-quarters of an ounce of indigo, and three ounces of oil of vitriol.

The indigo must be dissolved in the vitriol the day before it is used.

The silk, after being boiled in soap and water, must be rinsed in running water, and then wrung and well beaten. This being done, it must be coloured to a handsome light blue, in a cold or warm vat; then rinse it in running water, wring and dry.

As soon as the silk has become dry, it must be moistened in warm water, wrung, and laid by wet for further use.

Dissolve in a kettle with eight buckets of water, one pound and a quarter of alum, pour the solution into a tub, steep the silk in it, and work it well therein for the space of an hour; take it out, wring, and lay it aside wet for further use. Lastly, boil a kettle with eight buckets of water, and put into it two ounces and a half of cochineal; let it boil for about ten minutes, cool the liquor with a bucket of water, add the solution of tin and the chymic, and stir the whole well. Immerse the blue silk in the cochineal liquor, work it well therein until the liquor begins to boil—let it boil another hour, during which time, however, the silk must be continually worked; it must then be taken out, rinsed, wrung, and dried.

If the purple is required to be more on the red, increase the quantity of the cochineal—if more on the blue, take less.

To dye a handsome violet blue, on ten pounds of silk.

Take one ounce of indigo, twelve ounces of vitriol, one-quarter of a pound of alum, four pounds of logwood, and one pound of redwood.

Dissolve the indigo in the oil of vitriol, as usual. Dissolve in a kettle, with eight buckets of water, one pound and a quarter of alum; then pour the solution into a tub, and work the silk well therein for one hour, take it out, wring, and keep it wet for further use.

Fill a vat with eight buckets of water, put the solution of indigo in it, stir well, work the alumed silk therein for half an hour, then take it out and rinse it in running water.

Lastly; take a kettle with eight buckets of water, put into it four pounds of logwood, and one pound of redwood, also a quarter of a pound of alum; boil the whole well for forty-five minutes, then run the decoction through a sieve into a tub, steep the blue-coloured silk in it, and work well for one hour; after which, take it out, rinse in running water, wring and dry it.

To colour lilac on wool.

For sixteen pounds of wool, use one pound and three-quarters of alum, and one pound and a quarter of cream of tartar.

The ingredients to boil one hour, the liquor run up, and the wool to boil two hours; land it, and boil three ounces of cochineal for a quarter of an hour, cool down, heave in the wool rapidly, and boil to the colour wanted.

Any shade may be obtained by slightly bluing it in the woad vat, previous to dying it in the furnace, and by varying the quantity of cochineal.

To colour lilac on silk.

Boil it after pink, then take a thin liquor of lather, put into this some red orchille liquor, and work the silk well in it; then wet out in a lather, made with soap-lees and lime-water, in which it may be blued to the colour wanted.

To dye crimson.

For a crimson on forty-eight pounds of fine cloth. For the boiling, use three pounds of alum, two pounds of cream of tartar, half a pound of cochineal, and three pints of tin liquor.

Boil the ingredients one hour, cool down, heave in the cloth and boil two hours. Prepare a fresh liquor, and put in two pounds of alum, three pounds of pearlash, four pounds of Brazil wood, and one quart of urine.

Boil the wares one hour, then add the urine; cool down, heave in rapidly, and boil to the colour wanted. It is often finished without boiling, by keeping the liquor at a spring heat.

For a crimson on sixty pounds of wool.

For the boiling, use one pound of cochineal, three pounds of best crop madder, six pounds of argol, three pounds of alum, and two quarts of tin liquor.

Boil the alum, argol, and tin liquor, for half an hour, then add the madder and cochineal, boil ten minutes, run up, throw in the wool, and boil it two hours; run off the liquor, and wash clean.

Prepare a fresh liquor, with six pounds of cudbear, and two buckets of urine.

Boil the cudbear half an hour, and then put in the sig; as soon as this is done, run up the furnace, heave in cool, let it be two hours coming up to a spring heat, and it is finished.

For a crimson on silk.

The silk, intended to be dyed crimson with cochineal, should be boiled in the proportion of twenty pounds of soap to one hundred pounds of silk.

After washing and beetling the silks at a stream, in order to clear them from the soap, they are alumed in a strong alum liquor, and left in it from night until morning. After this, the silks are to be washed, and twice beetled in running water. Prepare a bath in the following manner: the long trough is charged with river water, about one-half or two-thirds, and, when boiling, some powdered nutgalls are to be put into it and suffered to boil for awhile; then put from four drachms to two ounces of galls for every pound of silk. When they are washed and beetled, they are to be put upon rods, by hanks. The cochineal, pounded and sifted, is then to be thrown into the bath, well stirred, and must receive five or six minutes boiling; from two to three ounces for each pound of silk are to be put in, according to the shade required.

These ingredients are to be put into pure soft water, in a clean copper vessel. When the cochineal and galls have undergone a boiling, put into the bath, for every pound of cochineal, one ounce of nitro-muriate of tin. The kettle is left to cool a little, the silk is entered, and worked for a few minutes; after this, it must boil for two hours—the silk must be worked now and then during the time of boiling. At the expiration of this time, the fire must be withdrawn, and the silks immersed in the liquor for five or six hours, or more. By this means they receive a fine half-dye—they are to be washed, given two beetlings, wrung as usual, and spread upon poles to dry.

A high-coloured crimson, on ten pounds of silk.

Take one pound and a quarter of cochineal, one pound of galls, four ounces of cream of tartar, and two pounds and a half of alum.

Dissolve the alum in a kettle, with ten buckets of water; pour the clear part into a tub, put in the silk, and work well therein for four hours; take out, rinse, wring it, and lay by wet for further use.

Put into a kettle, containing eight buckets of boiling water, one pound and a quarter of ground cochineal, one pound of powdered nutgalls, and four ounces of cream of tartar. Let the whole boil gently for fifteen minutes; cool with two buckets of water, work the silk well in the liquor (kept boiling) for one hour and a half; then take out, rinse, wring, and dry it.

For a cheaper colour, reduce the quantity of cochineal to ten ounces, and use three pounds of cudbear.

A good crimson, on ten pounds of silk.

Take three pounds of alum, half an ounce of argol, half a pound of East India galls, and one pound nine ounces of cochineal.

Heat eight buckets of soft water, in a clean kettle, lukewarm; dissolve the three pounds of alum therein, take out the solution and put it into a tub, immerse the silk in it, and work it well for eight hours. Take it out, wring lightly, and lay it by wet for further use.

Take eight buckets of clear water, bring it to boil, and put into it the following articles: half an ounce of argol, and half a pound of the India galls; let these boil well for ten minutes, and run the liquor through a sieve into a tub; then pour the liquor back into the kettle, and put into it the cochineal; let it boil for ten minutes, cool the liquor with half a bucket of water, immerse the silk in this liquor, and work it well for two hours, during which time the liquor must be kept boiling. Take it out, rinse it well, wring it well, and dry it.

Take a kettle with ten buckets of spring water, and heat it to 130° Fahrenheit, work the silk in this for forty minutes, take it out, wring, and dry it.

A good crimson, on ten pounds of silk, in another way.

Take two pounds and a half of alum, two pounds of fine galls, one pound four ounces of cochineal, one-quarter of a pound of argol, and eight ounces of spirits of ammonia.

Take a kettle with eight buckets of water, put into it two pounds of galls, boil for fifteen minutes, run the liquor through a sieve into a tub—steep the silk in the liquor, and work it well for four hours; take it out, rinse, wring, and dry it.

Take a kettle with eight buckets of water, and dissolve in it two pounds of alum, pour it into a tub, steep the silk in it, and work it for four hours; then take it out, wring, and lay it by wet.

Pour six buckets of water into a kettle, add the cochineal, argol, and spirits of ammonia, let all boil for ten minutes, cool the liquor with two buckets of water, work the silk in it for two hours, during which time keep it boiling; then take it out, suspend it on the rods over the tub, pour the liquor from the kettle into it, and work the silk in the liquor until it has become cool; take out, rinse, and dry in the shade.

Other colours may be obtained from the remains of these liquors, by pouring the alum liquor into the colouring liquor. You may produce colours in this, at a proper heat, from the rich peach blossom down to a light lilac. After this a golden yellow may be obtained, in the same liquor, from any silk having a pale yellow ground.

To dye pinks on woollen.

To colour fifty pounds of cloth a fine pink. Boil it first in four pounds of alum for one hour, heave out, and add to the liquor four pounds of cream of tartar, two quarts of tin liquor, and one pound of cochineal.

Boil the cloth until the colour is rich and bright. If wanted to be bluer, add urine to the liquor until blue enough.

For a pink, on sixteen pounds of wool.

For the boiling, use five ounces of cochineal, two pounds and a half of alum, and one pound and three-quarters of cream of tartar.

Boil the alum and tartar for half an hour, then the cochineal for a quarter of an hour; cool down, heave in the wool, boil two hours, and let lay all night.

Pinks may be made into rich wine colours, by boiling them in a strong crop madder liquor—or into lilac, by bluing them in a very weak vat, to a thin sky-blue, before dying pink. If done in too strong a vat, it will make a purple.

To dye ten pounds of cotton yarn a pink.

Use three pounds and a half of safflower, three pounds and a half of cream of tartar, one pound and three-quarters of pearlash, and one pound of oil of vitriol.

To dye pink on silk.

Take of safflower, one hundred and twelve pounds, wash it well in a tub of water, having a reel placed inside of it, until all the yellow comes out; when well washed, fill up with clean water, and add four pounds of pearlash, draw this off, fill again with water, and let lay until the flower is quite white. The two last liquors are used for dying the pink; add to it two or three pails of lime-juice, which will neutralize the pearlash, and produce a beautiful rose colour. Take large hanks of silk, and let them lay in the liquor until all the colour is extracted; then throw the liquor off, and pump up with fresh water, add to it one pail of lime-juice, and let the hanks lie in this liquor till wanted. Wring out the hanks when wanted, put them in water of a milk heat, with a small quantity of pearlash; when the silk has spent its colour, add a little lime or lemon juice, to bring to the colour wanted.

If any of the silk should not be dark enough, redye until like the darkest. After the pink is dark enough, wring the silk out in handfuls, then make a small tub of water with lime-juice, give a few turns in this, wring out, and dry.

Some dyers use cream of tartar, and oil of vitriol, in place of lime-juice.

For a pink, on ten pounds of silk.

Take fifteen pounds of safflower, fifteen quarts of strong vinegar, three-eighths of an ounce of oil of vitriol, one pound fourteen ounces of pearlash, and four ounces of cream of tartar.

Put the safflower into a bag, wash all the yellow out of it, dissolve the pearlash in water, pour the clear part of this liquor on the safflower in a tub, mix it well, and set it by for six hours. At the expiration of this time, run the liquor through a sieve into a tub, pour half a bucket of water on the bag, and press it out, to extract the remaining colour; pour the vinegar and the oil of vitriol into the liquor; then take the silk, fix it upon rods, put it into the liquor, and work it well therein for four hours; take it out, rinse it in running water, wring it well, and lay it aside in its wet state for further use.

Dissolve the cream of tartar in river water, and pour the clear part of this solution into a tub, with eight buckets of soft water; immerse the silk in this solution, work it well therein for a quarter of an hour, take it out, wring, and dry it.

To dye mulberry on woollen.

For forty-eight pounds of cloth, for a rich mulberry. For the boiling, use three pounds of alum, two pounds of cream of tartar, three pints of tin liquor, one pound of argol, and one pound of cochineal.

Boil the ingredients for half an hour, cool down, heave in the cloth rapidly, and boil two hours. Finish in a fresh liquor, with three pounds of alum, sixteen pounds of Brazil wood, fourteen pounds of logwood, one pint of tin liquor, and one pound of best crop madder. Boil the wares two hours, cool down, enter the cloth rapidly, and boil to the colour wanted.

For a dark mulberry, on sixteen pounds of wool.

For the boiling, use eight pounds of barwood, two pounds and a half of logwood, and one-quarter of a pound of cream of tartar.

Boil the wares two hours, cool down, heave in the wool, and boil it three hours, cool down, and sadden with one-quarter of a pound of copperas—let lie in all night.

To colour mulberry on silk.

Boil with coloured soap, and wash out; alum, and wash out; take three or four pails of Brazil liquor, put it into a tub, and throw on it nine or ten pails of boiling water, pump up, stir well, and put in half a ladle of logwood liquor; turn the silk in this seven or eight times, then take it out and lay it by the furnace—add more logwood and Brazil wood, till of the desired colour. When nearly dark enough, throw a pail of urine into a tub of clean water, milk-warm, turn in, and make rather bluer than the pattern. If the urine does not make it blue enough, take a clean liquor, and blue with pearlash.

Plum colours are dyed the same as mulberry, only with less Brazil wood.

To dye claret on woollen.

For a claret on forty-eight pounds of cloth. For the boiling, use five pounds of alum, one pound of argol, five pounds of Brazil wood, five pounds of logwood, and one pound of madder.

Boil the wares two hours, run up, heave in the cloth, and boil one hour and a half; then finish in a fresh liquor, with six pounds of Brazil wood, and one pound and a half of pearlash.

Boil the wares half an hour, run up, heave in cool, and bring on gradually; boil till of the colour wanted.

For a dark claret on sixteen pounds of wool.

For the boiling, use nineteen pounds of barwood, and half a pound of cream of tartar.

Boil the wares two hours, run up, heave in the wool, and boil gently for three hours—cool down, and sadden with four pounds and a half of copperas; let lie in all night.

For a lighter claret, on one hundred and seventy pounds of wool.

For the boiling, use one hundred and sixty-eight pounds of barwood, and ten pounds of cream of tartar.

Boil the wares two hours, cool down, heave in the wool, and boil three hours; cool down, and sadden with two pounds of copperas; let lie in all night.

To colour morone on silk.

Wash from boiling in soap; alum for three hours, wash twice in cold water, stick up, take four or five pails of Brazil liquor, pour on water as hot as the hand can bear, put in the silk, and handle; when of the colour wanted, wring out, and dry in a stove.

To dye corbeaus on woollens.

For a very dark corbeau, on thirty-two pounds of wool. For the boiling, use twenty-two pounds of barwood, and six pounds of logwood.

The wares to boil three hours, the furnace run up, the wool entered, and boiled two hours; sadden with one pound of copperas, and twelve ounces of fustic—boil one hour and a half, and let lie in all night.

For a lighter corbeau, on thirty-two pounds of wool.

For the boiling, use sixteen pounds of redwood, and four pounds of logwood.

The wares to boil three hours, run up, heave in the wool, and boil it three hours; cool down, and sadden with six ounces of copperas—boil one hour, and let lie in all night.

For a brilliant corbeau, on one hundred and thirty-five pounds of wool.

For the boiling, use twelve ounces of cochineal, two pounds of Brazil wood, eight ounces of aquafortis simplex, ten pounds of argol, and ten pounds of alum.

Boil the wares, all but the cochineal, for two hours, then add the cochineal, and boil five minutes; heave in the wool, boil two hours, cool down, land, and wash.

Prepare a fresh liquor, in which boil twenty-four pounds of logwood, and one pound of alum, for two hours—heave in the wool and boil two hours; sadden with two pounds of copperas, and two pounds of aquafortis; boil one hour, and let lie in all night.

Lavender on woollen, for one hundred and thirty pounds of wool.

First day, woaded to a very light thin blue, then washed and finished in the furnace, with six pounds of alum, and five pounds of Brazil wood.

Boil the wares one hour, the wool two hours, cool down, and let lie in all night.

A dark lavender, on two hundred and seventy pounds of wool.

First, dye it a half blue in the vat, wash well and dye in the furnace with ten pounds of alum, and eighteen pounds of Brazil wood. Proceed as with the last.

There are many colours of a more complex kind than any I have given recipes for, being compounded of yellow, red, blue, and some mostly yellow; such are tea-browns, London-smoke, and Paris-mud, &c. I shall give recipes for those in this place, as the browns will then be complete.

For a tea-brown, on fifteen pounds of cloth.

For the boiling, use four pounds of alum, two pounds of argol, six pounds of madder, and four pounds of fustic.

Boil the wares one hour, run up, heave in the cloth, and boil one hour and a half; cool down, take out the cloth, and add to the liquor four pounds of logwood and half a pound of copperas; boil the wares half an hour, run up, heave in the cloth, and boil to the colour wanted.

For a tea-brown, on sixty pounds of wool.

For the boiling, use eighteen pounds of fustic, six pounds of barwood, five pounds and a half of logwood, four pounds of common madder, and half a pound of argol.

Boil the wares two hours, cool down, heave in the wool, and boil it two hours; cool down, and sadden with three-quarters of a pound of copperas; boil one hour, and let lie in all night.

For a tea-brown, on two hundred and twenty pounds of wool.

For the boiling, use one hundred and thirty pounds of fustic, sixteen pounds of logwood, and six pounds of barwood.

Boil the wares two hours, cool down, heave in the wool, and boil it two hours; cool down, and sadden with six pounds of copperas, and two pounds of alum.

A tea-brown, of a lighter shade, on eighty-seven pounds of wool.

For the boiling, use fifty-seven pounds of fustic, four pounds and a quarter of logwood, four pounds and a quarter of redwood, seven pounds of madder, and one pound of argol.

Boil the wares two hours, cool down, heave in the wool, and boil it two hours; cool down, sadden with two pounds and a quarter of copperas, and one pound of alum; boil one hour, and let lie in all night.

A dark tea-brown, on ninety pounds of wool.

For the boiling, use fifty-four pounds of fustic, four pounds and a half of madder, four pounds and a half of redwood, four pounds and a half of logwood, and one pound of argol.

Boil the wares two hours, cool down, heave in the wool, and boil it two hours; cool down, sadden with four pounds and three-quarters of copperas, and one pound and a quarter of alum; boil one hour, and let lie in all night,

For a London-smoke, on fifty pounds of wool.

For the boiling, use two pounds of rasped fustic, one pound and a half of redwood, one pound and a half of logwood, one pound and a quarter of umbro madder, half a pound of camwood, and five pounds of barwood.

The wares to boil two hours, run up, heave in the wool, and boil one hour and a half; cool down, and sadden with half a pound of copperas, and two pounds and a quarter of argol; boil one hour, and let lie in all night.

For a Paris-mud, on sixty-five pounds of wool.

Boil the wool, with twelve pounds and a half of alum, for three hours, land, and well wash; finish in a fresh liquor, with twenty pounds of chipped fustic, and twelve ounces of logwood.

Boil the wares two hours, run up, heave in the wool, and boil three hours, then throw on twenty pounds of rasped logwood, and boil three hours; cool down, throw on four pounds of rasped logwood, boil one hour, and let lie in all night.

For a dun colour, on sixty-seven pounds of wool.

For the boiling, use one pound of sumach, one pound of argol, two pounds and a half of logwood, two pounds of redwood, and add two ounces of chymic.

Boil the wares two hours, run up, heave in the wool, and boil two hours; cool down, sadden with half a pound of copperas, boil one hour, and let lie in all night.

More copperas will make it darker, so that a great variety of shades may be obtained, by adding or diminishing the copperas and logwood.

This colour has lately been very fashionable for pantaloons.

To dye drab on woollens.

In drabs, there are a great variety of colours, and an immense number of shades; some have a blue hue, some a red, some a yellow, and there are a number that do not appear to partake of either of these hues. I shall begin with drabs that have a blue hue, and proceed with others in the order mentioned.

For a very light blue drab, on forty-five pounds of cloth.

For the boiling, use two pounds of alum, one pound and a half of argol, and two pounds of chipped logwood.

Boil the wares one hour, cool down, heave in the cloth, and boil two hours; cool down, take out the cloth, bring the furnace to a boil, and while boiling drop in two ounces of chymic; boil ten minutes, cool down, heave in the cloth very rapidly, and turn the reel as fast as the cloth can be opened; after it is entered, bring the liquor to a boil, and run until the desired colour is obtained.

Blue drabs may be made of any shade, by using more or less of chymic and logwood.

For a blue drab, on thirty pounds of wool.

For the boiling, use one pound and a quarter of weld, one pound of common madder, half a pound of logwood, and half a pound of argol.

Boil the wares one hour, cool down, heave in the wool, and boil one hour; then add two ounces of alum, three ounces of copperas, and one-eighth of a teacupful of chymic—boil three quarters of an hour, and let lie in all night. A little orchille will give a blue tint to these colours, and, when used, the chymic may be dispensed with.

I must inform those who are not well versed with working wool in the furnace, that whenever chymic is added in the saddening, it must be first mixed in a bucket of the liquor, and spread over the wool, a small quantity at a time, while the wool is being rapidly worked. Those who are quite ignorant of the process, had better cool the liquor down to 140° Fahrenheit, land the wool, and mix the chymic in the liquor, by stirring it well previous to re-entering the wool.

For a very dark blue drab, on one hundred and twenty pounds of wool.

For the boiling, use twelve pounds of weld, two pounds of fustic, eight pounds and a half of logwood, and two pounds of argol—add one teacupful of chymic.

Boil the first four articles one hour, then drop in the chymic while the furnace is boiling; boil ten minutes after it is in, cool down, enter the wool, and boil it one hour; then sadden with one pound and a half of alum, and boil a quarter of an hour—then one pound and a half of copperas, and a teacupful of chymic; boil one hour, and let lie in all night.

For a blue drab, on sixty-five pounds of wool, a thin colour.

For the boiling, use one pound and a half of weld, five ounces of logwood, one pound of alum, one pound of argol, one ounce of chymic, and one ounce of copperas.

Boil the wares two hours, run up, heave in the wool rapidly, and work quick; let boil two hours, cool down to about 120° Fahrenheit, land the wool, wash, and dry it.

For a very light blue drab, on sixty-five pounds of wool.

For the boiling, use three pounds and a half of weld, one pound of alum, one pound of argol, nine ounces of logwood, two ounces of copperas, and two ounces of chymic.

Boil the wares two hours, run up, heave in the wool rapidly, work quick, and let boil two hours; cool down to about 120° Fahrenheit, land the wool, wash, and dry.

For a blue drab, rather darker than the above, on sixty-five pounds of wool.

For the boiling, use three pounds and a half of weld, one pound of alum, one pound of argol, twelve ounces of logwood, two ounces of copperas, and two ounces of chymic.

Boil the wares two hours, run up, heave in the wool rapidly, work quick, and let boil two hours; cool down to about 120° Fahrenheit, land the wool, wash, and dry.

To dye red drabs on woollen.

There are an immense variety of shades in the red drab. I shall begin with the fawn drabs, which are the lightest of the class, and gradually progress to the darker shades

For a very light drab, having a red hue, on one hundred and twenty pounds of cloth.

Boil two pounds of alum, two pounds of argol, one pound and a half of best madder, one quart of tin liquor, and twenty pounds of fustic.

Boil the wares two hours, cool down, enter the cloth, and boil one hour and a half, or till of the colour wanted. Any shade may be obtained, by adding more or less of madder and fustic, as well as of tin liquor.

A strong decoction of alder bark makes a red drab without any mordant; blue vitriol darkens it, without injuring the red; and copperas turns it of a greenish drab. These red drabs are of a pleasing hue, and are very permanent. The bark should be used by our American dyers.

For a very light fawn, on sixty-five pounds of wool.

Where weld is given in my recipes, fustic may be used in place of it, only using half the quantity. It is much to be regretted, however, that weld is not more generally used in this country, particularly in drab dying, as the colours from weld are much brighter and softer than from any other dye-stuffs, and the handle of the cloth is much improved.

For the boiling, use one pound and a half of weld, one-quarter of a pound of alum, one-quarter of a pound of red sanders, one-quarter of a pound of logwood, one pound of best madder, and three ounces of copperas.

Boil the wares one hour and a half, cool down, boil the wool two hours, or till of the colour wanted, heave out, wash, and dry—having previously cooled down to 120° Fahrenheit.

Another light fawn, on forty-five pounds of wool.

For the boiling, use one pound and a half of weld, six ounces of alum, fourteen ounces of best madder, two ounces and a half of logwood, two ounces and a half of sanders, and two ounces and a quarter of copperas.

Boil the wares one hour and a half, cool down, and boil the wool two hours, or till of the colour wanted; cool down to 120° Fahrenheit, land, wash, and dry. By leaving the wool in the liquor all night, the colour will deepen two or three shades.

A rich red fawn, on sixty-five pounds of wool.

For the boiling, use two pounds and a half of fustic, two pounds and a half of madder, one pound and a half of bar-wood, twelve ounces of red sanders, one-quarter of a pound of argol, six ounces of copperas, and one-quarter of a pound of alum.

Boil the wares two hours, cool down, and boil the wool two hours, or till of the colour wanted. When to the pattern, cool down to 120° Fahrenheit, land, wash, and dry. If not dark enough, let it lie in all night.

For a light fawn, on twenty-five pounds of wool.

For the boiling, use two ounces of barwood, three ounces of sumach, four ounces of argol, eight ounces of madder, three ounces of copperas, three ounces of fustic, two ounces of red sanders, and three ounces of alum.

Boil the wares two hours, cool down, and boil the wool two hours, or till of the colour wanted. When to the pattern, cool down to 120° Fahrenheit, land, wash, and dry.

For a light fawn, on sixty-five pounds of wool.

For the boiling, use half a pound of fustic, one pound of sumach, half a pound of Brazil wood, one pound of red sanders, twelve ounces of argol, one pound of best madder, seven ounces of copperas, and eight ounces of alum.

Boil the wares two hours, cool down, and boil the wool two hours, or till of the colour wanted. When to the pattern, cool down to 120° Fahrenheit, land, wash, and dry.

For a light red drab, on thirty pounds of wool.

For the boiling, use four ounces of nutgalls, and one pound of madder.

Boil the wares half an hour, run up, heave in the wool, and boil half an hour; cool down, and strew over one-quarter of a pound of copperas, two ounces of alum, and boil half an hour—while boiling, strew over six ounces of ground fustic, and six ounces of cream of tartar; boil half an hour, and if dark enough, cool down, and land—if not, let lie in all night.

For a rich reddish drab, on forty-two pounds of wool—a fashionable colour at the present time.

For the boiling, use six ounces of nutgalls, six ounces of argol, ten ounces of redwood, one pound of madder, and twelve ounces of fustic.

Boil the wares two hours, cool down, and boil the wool two hours; cool down, and sadden with three ounces of copperas. Boil one hour and land, if dark enough—if not, let lie in all night.

For a rich reddish drab, of a lighter shade than the above, on thirty pounds of wool.

For the boiling, use three ounces of nutgalls, four ounces of argol, seven ounces of red sanders, eleven ounces of madder, ten ounces of fustic, and one ounce of logwood.

Boil the wares two hours, cool down, and boil the wool two hours; cool down, sadden with two ounces and a half of copperas, boil one hour and land, if dark enough—if not, let lie in all night.

For a darker red drab than either yet given, on forty-two pounds of wool.

For the boiling, use six ounces of nutgalls, six ounces of argol, ten ounces of redwood, one pound of madder, and twelve ounces of fustic.

Boil the wares two hours, cool down, and boil the wool two hours; cool down, sadden with three ounces of copperas, boil one hour and land, if dark enough—if not, let lie in all night.

For a very dark red drab, approaching to a brown, on thirty pounds of wool.

For the boiling, use five pounds of fustic, and three pounds of red sanders.

Boil the wares two hours, cool down, and boil the wool two hours; cool down, sadden with eight ounces of copperas, boil one hour, and let lie in all night.

For a dark red drab, lighter than the above, for thirty pounds of wool.

For the boiling, use four ounces of nutgalls, one pound and three-quarters of red sanders, two ounces of logwood, and one pound and a quarter of fustic.

Boil the wares two hours, cool down, and boil the wool two hours; cool down, sadden with four ounces and a half of copperas, boil one hour, and let lie in all night.

To dye yellow drabs on woollen.

As these are the colours most generally worn, I shall give more recipes than for the others, including a greater variety of shades.

For a very light drab, having a slight yellow tinge, on eighty pounds of wool.

For the boiling, use one pound and a half of ground fustic, half a pound of logwood, and four ounces of best madder.

The wares to boil two hours in a coarse bag, the furnace run up, and the wool to boil two hours—cool the liquor, then sprinkle over, for saddening, one pound of alum, and four ounces of copperas, having previously dissolved them in a bucket of the liquor; let the wool boil one hour, run off the liquor slowly, and while this is doing, run up with water sufficient to cool the liquor, so low as to make it pleasant to immerse the hand; when the liquor is all run off, land the wool, and wash well.

For a drab, a few shades darker than the above, on forty-two pounds of wool.

For the boiling, use one pound and a half of fustic, twelve ounces of logwood, four ounces of madder, and eight ounces of alum.

To be proceeded with as for the last, and add for the saddening, half a pound of copperas—let boil for half an hour, land, and wash, as before.

For a darker colour, varying a little in the shade, on seventy-four pounds of wool.

For the boiling, use two pounds of fustic, one pound of logwood, and half a pound of madder.

To be proceeded with as for the two last, sadden with one pound of alum, and twelve ounces of copperas—boil half an hour, and let lie in all night.

For a light yellow drab, on seventy-five pounds of wool.

For the boiling, use ten pounds of weld, two pounds of logwood, one pound of argol, one pound of alum, and four ounces and a half of copperas.

Boil the weld in bags one hour, take it out, add the other ingredients, boil half an hour, run up, heave in the wool, and boil it two hours—then run up, add six ounces of oil of vitriol, and work well for twelve minutes without boiling—if the colour is dark enough, cool down, run the liquor off, and wash; if required to be darker, let it lie in all night.

For a light drab, not so yellow as the last, on sixty-five pounds of wool.

For the boiling, use four pounds of weld, half a pound of fustic, one pound and three-quarters of logwood, half a pound of umbro madder, twelve ounces of argol, and half a pound of alum.

The weld to be boiled in bags, and taken out as in the last, the other wares to boil one hour; cool down, add one ounce and a half of copperas, and one ounce of oil of vitriol; boil half an hour, run off, or let lie all night, according to the colour wanted.

For a yellow drab, on thirty pounds of wool.

For the boiling, use three ounces of nutgalls, one pound of fustic, one-quarter of a pound of madder, three ounces of argol, half a pound of alum, and two ounces of copperas.

Boil the wares two hours, cool down, heave in the wool, boil half an hour, and let lie in all night.

For a yellow drab, on sixty-five pounds of wool.

For the boiling, use two pounds of weld, six ounces of argol, five ounces of logwood, three ounces of barwood, one pound of madder, three ounces of copperas, and two ounces of alum.

Boil the wares two hours, cool down, heave in the wool boil one hour, and let lie in all night.

For a dark yellow drab, on sixty pounds of wool.

For the boiling, use five pounds of weld, six ounces of red argol, and four ounces of rasped fustic.

The wares to boil as before, heave in the wool, and boil one hour; then add, by strewing over, fourteen ounces of ground logwood, and fourteen ounces of umbro madder. The wool to boil two hours, cooled down, and landed; add to the liquor four ounces of copperas, and four ounces of alum; stir well, heave in the wool, boil one hour, and let it lie in all night.

Another dark yellow drab, on sixty pounds of wool.

For the boiling, use five pounds of weld, one pound and a quarter of fustic, one pound of logwood, three pounds of mull madder, and half a pound of copperas.

The weld to be boiled one hour and taken out, then add the other materials, boil one hour, heave in the wool, boil two hours, land, or let it lie in all night.

There are many drabs that do not come under the denomination of blue, red, or yellow—such are pearl drabs, green drabs, &c. I shall proceed to give recipes for these, as both of them are now fashionable.

For a very light white pearl, on thirty pounds of wool.

For the boiling, use four ounces of alum, and one ounce and a half of logwood.

Let the wares boil half an hour, run up, heave in the wool, and bring the liquor to a spring heat; keep at this heat for a quarter of an hour, land, and wash. The wool must be handled briskly all the time it is in the furnace.

For a light red pearl drab, on thirty pounds of wool.

For the boiling, use three ounces and a half of argol, two ounces of logwood, one ounce and a half of Brazil wood, one ounce of redwood, one ounce of alum, and one ounce of copperas.

The wares are to be boiled half an hour, the furnace run up, the wool entered and boiled a quarter of an hour, cooled down, landed, and washed.

For a pearl drab, on sixty pounds of wool.

For the boiling, use eight ounces of nutgalls, and four ounces of madder.

The wares are to be boiled half an hour, the furnace run up, the wool entered and boiled a quarter of an hour, ; while boiling, add two ounces of alum, cool down, and land.

For a pearl drab, on thirty pounds of wool.

Boil one peck of bran, to soften the water, and scum clean.

For the boiling, use two ounces of fustic, three ounces of nutgalls, five ounces of argol, three ounces of logwood, one ounce and a quarter of Brazil wood, and three ounces of madder.

Boil the wares one hour, cool down,, heave in the wool, and work briskly; boil one hour, cool down, and sadden with one ounce of copperas, one ounce of alum, one-quarter of an ounce of fustic, and one ounce and a half of logwood—boil half an hour and land, or let lie in all night.

For a dark pearl drab, on sixty-five pounds of wool.

For the boiling, use one pound of weld, one-quarter of a pound of fustic, eight ounces of logwood, twelve ounces of argol, twelve ounces of alum, ten ounces of fine madder, and two ounces of copperas.

Boil the wares one hour, cool down, heave in the wool, and boil it two hours; cool down to 120° Fahrenheit, land, and wash.

For a thin pearl drab, on thirty pounds of wool.

For the boiling, use two ounces of weld, four ounces of argol, four ounces of alum, one ounce of logwood, half an ounce of oil of vitriol, two ounces of madder, and half an ounce of copperas.

Boil the wares one hour, cool down, heave in the wool, and boil it one hour and a half; cool down to 120° Fahrenheit, land, wash, and dry.

To dye green drabs on woollens.

For a light green drab, having an olive hue, on twenty-nine pounds of wool.

For the boiling, use three pounds and three-quarters of weld, half a pound of logwood, and one-quarter of a pound of fustic.

The weld to be boiled one hour and taken out, then the other wares one hour, the furnace run up, the wool entered and boiled one hour; cool down, sadden with one ounce and a half of copperas, and twelve ounces of alum—boil one hour, and land.

For a dark green drab, on fifty-eight pounds of wool.

For the boiling, use five pounds of fustic, two pounds of logwood, and half a pound of madder.

Boil the wares two hours, run up, enter the wool, and boil it two hours; cool down, sadden with twelve ounces of alum, four ounces of pearlash, and two ounces of copperas. Boil half an hour, and then add a quarter of a pint of oil of vitriol; let it lie in all night.

Miscellaneous colours, or colours coming under no particular denomination.

These colours are, mostly, between drabs and browns. I can only describe them according to their predominant hue.

Many of them are now quite fashionable for pantaloons, and others are mostly employed for mixtures. I shall give those intended for mixtures first, and then those for colouring.

For a red brown, of a very lively tint, on twenty pounds of wool.

This recipe is intended for mixing with dark colours, and has been fashionable in dark drab mixtures.

For the boiling, use two ounces of nutgalls, two pounds of madder, and four pounds of red sanders.

Boil the wares two hours, run up, heave in the wool, and boil two hours; cool down, sadden with one ounce of copperas, boil one hour, and let lie in all night.

For a very bright colour, almost a red, on the cinnamon hue, for fifty-seven pounds of wool.

For the boiling, use nine pounds of alum, and forty pounds of fustic.

Boil the wares two hours, run up, heave in the wool, and boil two hours; cool down, land, and wash.

Prepare a fresh liquor, bring on to a boil, bran and scum well—put in seven pounds of madder, run up, heave in the wool, and boil one hour; cool down to 120° Fahrenheit, land, and wash.

For a thin red, on twenty pounds of wool.

This colour is rather on the orange hue. Bring the furnace to a boil, add two pounds of argol, boil one hour, cool to below boiling, add to the liquor four pounds of madder, heave in the wool, boil half an hour—cool down to 120° Fahrenheit, land, and wash.

For a Brazil red, on twelve pounds of wool.

Bring the furnace to a boil, add two pounds and a half of alum, and four pounds of Brazil wood—boil the wares one hour, cool down, heave in the wool, boil forty-five minutes—cool down, after lying one hour, to 120° Fahrenheit, land, and wash.

For a deep sanders red, on forty-five pounds of wool.

For the boiling, use six pounds of red sanders. Boil the wares one hour, run up, heave in the wool, and boil two hours; cool down, and sadden with four ounces of copperas; cool down, land, and wash. If required darker, let it lie in all night.

For a rich wine colour, on thirty pounds of wool.

For the boiling, use four pounds of red argol, and two pounds of Brazil wood.

Boil the wares two hours, run up, heave in the wool and boil it two hours, then sprinkle over one gallon and a half of stale urine, and let lie in all night—work it well as the urine is entered. Wash well, and finish in fresh liquor, with twenty pounds of best madder—boil one hour, let lie in the liquor nine hours after boiling, land and wash.

The above is one of the richest colours that can be made, and is often worn by the ladies, for cloaks, &c.

A fugitive wine colour, in imitation of the above, but much poorer in body and tint, for sixty-three pounds of wool.

For the boiling, use forty pounds of barwood, boil the wool one hour and a half, then strew over six pounds and a half of alum, boil one hour, and let lie in all night. Land the wool the following morning, wash well, and finish in a fresh liquor, with eight pounds of Brazil wood, ten pounds of peach wood, and ten pounds of fustic—boil the wool two hours, and let lie in all night.

For a bright red for mixtures, of the cinnamon hue, on forty-six pounds of wool.

For the boiling, use twenty-three pounds of barwood, and fourteen pounds of fustic.

Bring the liquor to boil, boil the wares two hours, run up, heave in the wool, work rapidly, let it be two hours and a half coming to a boil—boil a quarter of an hour, cool down to 120° Fahrenheit, land, and wash.

For a dark muddy drab, lately fashionable, on sixty-five pounds of wool.

For the boiling, use one pound and a quarter of fustic, ten ounces of barwood, ten ounces of sumach, six ounces of red sanders, six ounces of Brazil wood, twelve ounces of argol, and two pounds and a half of madder.

Boil the wares two hours, run up, heave in the wool, and boil two hours; cool down, sadden with one ounce and a half of copperas, and four ounces of alum; boil one hour and a half, run up, and let lie in all night.

By varying the above materials, all these different dirty brown drabs, so lately fashionable, may be readily obtained. I shall give one other recipe for a variety of this colour, being yellower, not so much on the red, and lighter than the above.

For a muddy drab, on sixty-five pounds of wool.

For the boiling, use two pounds of fustic, half a pound of sumach, one pound and three-quarters of barwood, half a pound of red sanders, one-quarter of a pound of Brazil wood, one pound and a quarter of argol, and four pounds and a quarter of madder.

Boil the wares two hours, run up, heave in the wool, and boil two hours; cool down, sadden with one pound and three-quarters of copperas, and one-quarter of a pound of alum—boil one hour and a half, run up, and let lie in all night.

To dye drab on cotton.

Mix fustic and sumach liquor with warm water, turn in the cotton, and work it well; if for a brownish drab, turn the cotton into a weak copperas liquor; if for a greenish drab, mix logwood with the fustic and sumach, and a little blue vitriol with alum and copperas—when well worked, wring out lightly, and it is finished.

To dye a drab on silk.

Boil it in black soap, wash out, and stick up as for other colours—put a little spent orchille into a very warm liquor, a little fustic, a little logwood, and strew in a little copperas; stir up well, and try a pattern—when too blue, use a little argol, or cream of tartar, which will raise the red of the logwood.

Process of aluming silk.

Wash the silk from the soap, well beetling it; steep it in the alum liquor for nine or ten hours, using about five ounces of alum to each pound of silk, and four ounces of pearlash to every twenty pounds of alum, wash, wring with the hand, and lay by for further use. The pearlash is used to neutralize the excess of sulphuric acid contained in the alum.

Silk indigo vat.

This vat is the same as is known in this country by the name of ash vat, such as was attempted to be palmed on the woollen dyers of this country, some years since, by a Mr. Roach, as the woollen woad vat. It is the best vat for silk, and may be used for cotton, but is altogether unfit for woollen dying, for the very reason that it is worked with caustic potash, which cannot fail, under any circumstance, to injure the quality of the wool. The following is the process of setting the ash vat.

Put fifty pounds of potash into a barrel, and fill it up with boiling water. It is from this barrel the vat is supplied, when potash liquor is mentioned in the recipe.

Process of setting an ash vat.

Add one pailful of wheat bran to fifty gallons of water, boil thirty minutes, and empty the whole into the vat. Fill the boiler with fifty gallons more of water, add to it ten pounds of wheat bran, ten pounds of potash, and one and a quarter pounds of madder—boil thirty minutes, let it settle, and pour the clear liquor into the vat. When the heat of the vat has lowered to 140° Fahrenheit, add to it five pounds of well-ground indigo, and three gallons of swill—rake and cover down, keep as near 130° Fahrenheit as possible. Stir morning and evening. When the liquor is covered with a copper scum, and the flowers are of a dark blue, add one gallon of potash liquor from the barrel, and half a gallon of swill, at morning, noon, and night, raking well each time. Should the copper appearance cease, or fail to show itself, add one gallon of swill, mornings and evenings, until it does. When this one hundred gallons of liquor is in good order, fill the furnace with one hundred gallons more of clean water, add ten pounds of wheat bran, ten pounds of potash, and one pound and a quarter of madder, boil thirty minutes, cool down to 131° Fahrenheit—pass the clear liquor into the vat, and add to it five pounds of ground indigo and three gallons of swill, rake well, and cover close till next morning. Rake again in the morning, and if in order, add to it one gallon of potash liquor, and half a gallon of swill—add the same quantity at noon, and again in the evening. Should there be no copper skin on the liquor the morning after renewing, must only rake well morning and evening till it appears. When this two hundred gallons is in good order, boil two hundred gallons more of clear water, with ten pounds of bran, twenty pounds of potash, and two pounds and a half of madder; boil as before, for thirty minutes, let settle, turn the clear liquor into the blue vat, give it ten pounds of indigo, and four gallons of swill—rake well, and cover close. Rake the following day, morning and evening, and the second morning there will be a copper scum on the surface; then add to it two gallons of potash liquor, and one gallon of swill, morning and evening. The strength of this liquor should rate from two to three degrees, on Baume's hydrometer. If below two degrees, potash liquor should be added until it stands at two degrees.

Should the vat contain but three hundred gallons, add, in the last operation, only one hundred gallons of water in place of two hundred, and the other materials in proportion.

Working the ash vat.

The goods to be well wet in hot water, and left to drain until nearly dry, then run in the vat for fifteen or twenty minutes, wrung out, and dried—the dipping to be repeated until dark enough. After every dip, add to the vat one gallon of swill, and one gallon of potash liquor from the barrel, then rake, and keep at the temperature of 120° or 125° Fahrenheit. This last rule should in all cases be observed, unless the dye be too weak or too strong, too much fermented or not enough—in either of these cases, follow the directions given under the head renewing the vat. Three or four dips may be made each day, until the strength of the vat is mostly worked out, but must not reduce the liquor too much the first time of working.

To renew the ash vat.

Rake the dye up well, turn over about one hundred and forty gallons of the liquor into the boiler, and add to it ten pounds of bran, and two pounds of madder; boil for thirty minutes, let settle, turn the clear liquor into the vat, add to it fifteen pounds of indigo, and three gallons of swill liquor, rake well, and cover down. The next morning a fine copper scum will appear on the surface, then add to it one gallon of potash liquor, and seven gallons of swill, rake well, and cover down. Should the liquor indicate three degrees Baume, in three hours afterward, it is fit to colour; if it indicates less, add potash liquor and swill, in the same proportions as in the morning, until it rises to three degrees. The liquor, on the second renewal, may stand at four degrees; on the third and succeeding ones, at five degrees.

To make a new ash vat, after working out the old one.

Pass two hundred gallons of the clear liquor from the worn-out vat into the furnace, and after emptying out the remainder from the vat, return the liquor into it; then put as much water into the boiler as will fill the vat, add ten pounds of bran, three pounds of potash, and two pounds of madder; boil three minutes, let settle, empty the clear liquor into the vat, to which add fifteen pounds of indigo, and three gallons of swill, rake, and cover close. Next day, add potash liquor until the scale stands at five degrees.

Keeping the silk ash vat in order.

Should the liquor, by being kept too cold, lose its fermentation, boil one-quarter of the liquor in a furnace, add ten pounds of wheat bran, and seventeen pounds of madder, boil the usual time, let settle, return clear liquor into vat, stir, &c. Next morning add, if not sufficiently fermented, one gallon of swill, and repeat every six hours, until in good order.

Should the dye be too much heated, cool down, rake once a day, and add half a gallon of potash liquor—continue the same till the liquor appears perfectly clear; should it have lost its proper degree of fermentation, add at each stirring one gallon of swill, until it comes to work.

Should it be found necessary to lay a vat by for any considerable time, work it about half out, cover close, and it will keep six months.

On dying of double colours.

Cloth is sometimes dyed double colours, that is, one side of a cloth is dyed of one colour, and the other side of another.

Such colours are rarely seen in this country, and are now only seen occasionally in Europe; but as they were once fashionable, and may become so again, I shall finish the subject of dying by giving the process for dying these. The principal markets at the present time for double colours, are Turkey and Arabia. The Arabs cover their horses with cloth dyed purple and scarlet; by turning up the corners they show a beautiful drapery, and the corners being trimmed with gold or silver tassels, give to the horse's furniture a very rich and elegant appearance.

There are two kinds of double colours, those having green on one side and yellow on the other—and those having purple on one side and scarlet on the other. We will commence with the first.

Cloths made for double colours, should be fine in quality, wove very stout, eleven quarters in the loom, not more than twenty-four yards when fulled, and left under six quarters wide. They should have a good nap raised on both sides, and finished shearing before they are dyed. They must be well pized in fullers-earth, and dried to prepare them for the dye. When for yellow and green, the cloth must be first dyed a bright yellow, as follows: for forty-eight pounds of cloth, use, in the boiling, ten pounds of alum, two pounds of cream of tartar, and twenty-five pounds of fustic chips.

Boil the wares two hours, heave in the cloth, and boil it four hours—cool down, heave out, stream it until clean, and dry. A flour paste has now to be prepared. We have, in England, two sorts of wheat, one of which makes a flour that will afford a tougher paste than the other; when flour is ordered for double colours, it is always such as will produce the toughest paste. The paste is made the day before it has to be used. It requires a stiff paste, to prevent its penetrating through the cloth when rubbed on, yet thin enough to work thoroughly into the nap of the cloth. When this has been properly prepared, one end of the cloth is placed on a smooth table, about five feet wide and twelve long, beginning at one end, the side intended to be pasted laying uppermost. One person lifts the paste out of the tub with a clean tin or copper ladle, and places it on the cloth, while two others are employed in rubbing it into, and all over the face of the cloth, with their hands. As soon as a piece has been pasted, the two ends are brought together, and the whole piece doubled, leaving that side which has been pasted, inside. The cloth is now placed on a long scrave, or slatted table, four or more women are employed to sew the lists together, these are turned in and rolled before sewing, the work is drawn tight, and the stitches are close together, to prevent any liquor from penetrating through the lists. The two ends are rolled, and sewed up in the same way. Care must be taken, during this operation, that none of the paste touch the side of the cloth that has not been pasted, for in such places the cloth will not receive the destined colour. While this is doing, the furnace must be brought on with a new liquor, into which put four pounds of alum, four pounds of fustic, and three pounds of chymic. Boil the alum and fustic during two hours, drop in the chymic, and boil ten minutes. Let the cloth, which is now very heavy, be brought to the furnace on a clean hand-barrow, and placed on the curb—open a few stitches in the end of the cloth, sufficient to make such an aperture as will admit the nose of a bellows, and blow in as much air as can be forced into it. Let the opening be immediately sewed up. Two men must now carefully lift the cloth off the hand-barrow into the furnace, keeping the folds square and even, while two others are employed in placing it under the liquor with stopping sticks. Care must be taken not to hand it in faster than the stoppers can put it under the liquor, yet it is very necessary this operation should be performed as rapidly as possible. The air, blown in by the bellows, will be confined inside by the paste; and when the cloth comes in contact with the hot liquor, the air becomes so expanded as to swell the cloth out as large as a butt, and the air moving as the cloth is worked, prevents the paste from adhering, and enables the workmen to move it in any direction. It has now to be worked backwards and forwards, first on one side of the furnace, and then on the other—at every three or four turns, the end is tumbled over so as to bring the side that was lowest in the furnace to be uppermost. The working must be done expeditiously, to make the colour even—it should be had in cool, and the liquor brought on to a boil very gradually. When boiled to the colour wanted, the liquor is cooled down so far as to enable the workmen to handle the cloth, which has now to be lifted out by hand into a large back of cold water. Before opening the cloth, it must be streamed, until no stain appears on the water; when washed clean, the twine is taken from the lists, the paste scraped off as clean as possible, and then cleaned in the stocks until all the paste is completely washed off. It is then tentered, dried, pressed, and packed. The side that was pasted will now be of a beautiful yellow, and the other of a rich green.

It requires some experience to perform this operation with perfect safety, and the cloth must be free from holes or thin places.

To dye a double colour, having purple on the one side, and scarlet on the other.

The cloth has to be pized and dried, the same as before. It is now pasted when white, and sewed up, as directed for the yellow in the last. When this has been done, and the cloth moistened, take it on a hand-barrow to the blue vat, blow in the air, sew the hole up, take it into the blue vat, and work it until it becomes of a light blue. It is then taken out of the vat, the paste scraped off, and streamed. Care must be taken while this is doing, that none of the blue touches the side that has been pasted. When streamed, take it to the fulling-mill, and wash it under the hammers thoroughly. It must now be hung up to drain until the next day. When drained, clean it in the fulling-mill with earth, and dry it. The side that was pasted will now be white, and the other a light blue—the side that is blue must be placed inside, bringing the ends of the cloth together, and sewed up with rolled lists, as before, ends as well as sides, the same as for green. When this is done, take it to the scarlet furnace, and colour the white side scarlet, after the same way, with respect to workmanship, as directed for green. There having been no paste put on this time, the liquor will have penetrated sufficiently through the cloth, to make the side that was blue of a rich purple. The cloth has now to be well cleansed by streaming, after the ends and lists have been opened, and finished the same as the green.

This appears, on paper, to be a very simple operation, but is not found so in practice. The cloth must be made very stout, and very firm in the ground, to prevent the paste from working through it, and it becomes so heavy, when pasted, as to require four men to carry one piece on a hand-barrow, which makes the workmanship of very difficult operation, and renders it liable to be torn, thereby ruining the work.

Miscellaneous Articles.

Mode of dying cotton, by the Africans, a fine blue colour with the leaves of the indigo plant. From Mungo Park's Mission to Africa, page 133.

"A large quantity of wood ashes is collected and put into an unglazed earthen vessel, which has a hole in the bottom, over which is put some straw. Upon these ashes water is poured, which, filtering through the hole in the bottom of the vessel, carries with it the potass contained in the ashes, and forms a very strong lye, of the colour of strong beer; this lye they call *sai-gee*, ash-water.

"Another pot is filled not quite full of the leaves of the indigo plant, either fresh or dried in the sun, (those used at this time were dried,) and as much of the sai-gee poured on it as will fill the pot about half full. It is allowed to remain in this state for four days, during which time it is stirred once or twice each day.

"The pot is then filled nearly full of sai-gee, and stirred frequently for four days more, during which it ferments and throws up a copper-coloured scum. It is then allowed to remain at rest one day, and on the tenth day from the commencement of the process, the cloth is put into it. No mordant whatever is used; the cloth is simply wet with cold water, and wrung hard before it is put into the pot, where it is allowed to remain about two hours. It is then taken out and exposed to the sun, by laying it (without spreading it) over a stick, until the liquor ceases to drop from it. After this, it is washed in cold water, and is often beat with a flat stick, to clear away any leaves or dirt which may adhere to it. The cloth being again wrung hard, is returned into the pot, and this dipping is repeated four times every day for the first four days—at the end of which period it has in common acquired a blue colour, equal to the finest India baft."

To use bleaching salts, for whitening cotton-yarn or cloth.

Put into a tub fifty gallons of water, put twelve pounds of the oxy-muriate of lime (bleaching salts) into it, stir well, and let remain until it settles, which will take about five hours—try the strength with Tweedle's hydrometer: but before doing this, have a tub ready, and lift as much of the pure liquor out from the lime tub, as you mean to use at once, try the hydrometer in the pure liquor, and if it stands three degrees, it is fit for immediate use; if stronger, reduce to the requisite strength by adding water. Your cloth, before immersion, ought to be damp; after it has been boiled as usual with ashes, and well cleaned, let it remain in the steep for four hours, take out, wash well, give a vitriol sour, steep again, and wash well.

After taking all the clear liquor off your oxy-muriate of lime, put in a few pounds of fresh oxy-muriate, add water, stir well, let stand as before stated, and use in the same manner. Make no more liquor at a time than is wanted for immediate use, as it loses its strength by exposure.

Wilkins's patent mode of raising the nap of cloth.

Since publishing my former work on manufacturing of woollen cloth, a patent has been taken out in England by a Mr. Wilkins, of Tiverton, near Bath, Somersetshire, for raising cloth with wire in place of teazles.

Repeated attempts have been made within the last fifty years, to substitute wire for teazles on the old gig-mill barrel, but all these attempts have uniformly failed, it having been found that wire, when used in clearing out the wool from the ground of the cloth, would uniformly rob it so much as to injure the texture. Mr. Daniels, a mechanic in Mr. Wilkins's employ, observed that the cloth was injured in consequence of the great strain given to the goods whilst working round the barrel of the gig-mill, and that to make the wire answer, a new mode of applying the work must be discovered. This he effected, by working the cloth on polished marble slabs. He has two polished marble slabs, inclined on an angle of about forty-five degrees, over the face of which the cloth passes, hugging the slabs as it moves over, and the wire cylinders working all the time on the face of the cloth.

The machine, working the cloth, is very much like a double timming-hog, such as was much used before the general use of the gig-mill. The cloth moves by mechanical power, being first wound around a roller placed under one of the marble slabs, passing over the first slab, then through two rollers placed above the slabs, in the centre between the two, then over the face of the second slab, and winding around a roller placed under it. A piece of twenty-one yards is calculated to move over the slabs in about seventeen minutes. Rollers, clothed with wire, move rapidly over the face of the cloth, one to each slab, and they are set down by a gauge, so as either just to touch the face, or dip into it to any required depth. A trough, containing water, is placed under each roller, by which the cloth is moistened.

I have seen a sample of the card used by Wilkins. The wire is bent in a circle, very much the same as the teazle point, and is ground sidewise to a dull point.

Mr. Wilkins's cloth is now in greater repute than any other manufacturer's in England, and it is well known the finish of his cloth is alone the cause of its superiority. Would it not be advisable for our leading manufacturers to pay attention to this patented mode of working, and adopt it, if found advantageous.

On the residuums remaining after dying chromic yellow and orange.

I have given recipes for dying these colours in the body of the work. Most of our dyers being ignorant of the compounds remaining after the colours are finished, and of the valuable uses to which they may be applied by themselves and others, I have concluded it may be useful to draw their attention to the subject.

To enable the dyer to understand the nature of the residuums, it will be necessary to explain the component parts of the salts used in producing the colours, and the changes that take place during the operation of dying.

Chromate of potash is a compound of chromic acid and potash, in which the potash, dissolved by the acid, is put into a solid form by crystallization. There are two distinct salts of the chromate, one of a yellow colour, the other an orange. The yellow crystals contain one atom of chromic acid, and one atom of potash, or an equal portion of each. The orange-coloured crystals contain two atoms of chromic acid to one of potash, or double the quantity of acid to the potash.

The only other material, necessary in producing these colours, is some salt having lead for its base. Nitrate of lead is used by some dyers, and sugar of lead by others; nitrate of lead is lead dissolved in aquafortis—and sugar of lead is lead dissolved in the acid of vinegar, called acetic acid. Both of these salts are made to assume a solid form, by crystallization, in which state they are usually sold. Lead dissolved in any other acid will answer as well as the above, provided the potash, combined with the chromic acid, is more soluble in the acid combined with the lead, than in the chromic acid.

The dyer first impregnates the goods with a solution of the salt of lead, and then with a solution of the chromate of potash, dipping alternately in each, until the desired colour is obtained. During the working, the acetic acid of the sugar of lead leaves the lead, and combines with the potash of the chromate of potash; the chromic acid being liberated from the potash, and the lead from the acetic acid, the two combine and form a chromate of lead on the goods. The same effect takes place when nitrate of lead is used, but the residuums are different. The colour will now be a fine yellow, of the same substance and tint as the chrome yellow sold for painting. To raise this yellow to an orange, it is necessary to dip it in some caustic alkali, or alkaline earth, and caustic lime is usually employed.

We now see the rationale of the process, by which these beautiful colours are obtained, and I have endeavoured to explain it in such language as will enable the most unscientific workman to comprehend it.

We shall proceed to ascertain what remains in the residuums, after the dyer has produced the usual colours, and to what purposes it may be applied.

There must remain a considerable portion of chromate of lead, and a large quantity of the acid of vinegar, combined with potash, when sugar of lead has been used: and of aquafortis, combined with potash, when nitrate of lead has been employed. As these are expensive colours, it must be important to the dyer to know if the residuums can be so applied as materially to lessen the expense. In Scotland, they make a beautiful fawn colour by merely staining the yarn in a sumach liquor, and then dipping it in the solution remaining after the chrome dying, and I have no doubt that other beautiful shades might be produced, by varying the colours given previous to immersion in the remaining chrome liquors. It must be understood, that the colours will vary as much from the different mordants used in dying the preparatory colours, as from the colouring matters employed. After all this has been done, there will still remain a considerable precipitate of chromate of lead, of some value to painters, and a liquid solution containing mordants of some value—the latter we shall proceed to investigate.

When sugar of lead has been employed, the liquor remaining will contain acetate of potash, and when nitrate of lead has been used, it will contain nitrate of potash, or saltpetre. We have to ascertain by what means these two solutions can be further employed to the most advantage.

Acetite of alumina is the most valuable and most expensive mordant used in cotton dying. This mordant is made by dissolving sugar of lead and alum of commerce separately, and mixing the two solutions; the sulphuric acid of the alum combines with the lead of the sugar of lead, and the acetic acid, before combined with the lead, enters into combination with the alumina of the alum—the sulphate of lead being insoluble, will not interfere with the colouring. When chrome colours are produced with sugar of lead, we have ascertained that the residuum will be acetate of potash, and as the potash is more soluble in the sulphuric acid than in the acetic, our dyers have only to add to this residuum a solution of alum, and they will obtain the aluminous mordant. Exactly the same results must not be expected from this mordant as from that made in the direct way, as above stated, for the sulphate of potash, being also a soluble salt, must produce effects somewhat different. However different the effects may be, the mordant obtained will be found a valuable acquisition, particularly in dark colours, and may be found to produce many a new and beautiful tint.

Nitrate of iron is another mordant of great use in dying of black on cotton, and some other colours. This mordant is usually made by dissolving iron in aquafortis, at an expense, for a strong solution, of about twenty-three cents per pound. By adding copperas, which costs three and a half cents, to the residuum left when chrome colours are done with nitrate of lead, the nitrate of iron will be produced, and this mordant, now so expensive, will be obtained at a cost less than four cents per pound.

It is deeply to be regretted that our dyers are not more generally acquainted with chymistry, as that science would make plain to them the rationale of every process they follow, and how to make the most of their residuums. The art of dying, staining, and topical application, must for ever remain in the back ground in this country, unless as much science is acquired by our operatives, as the same class possess in Europe. I am aware that courses of lectures, as generally delivered in our cities, are too expensive, too remote in their application to the arts, and too full of learned technicalities, to benefit any but the literary class.

On the cold indigo vat, used by cotton dyers.

Recipes have been given in French, and other works, on the proportion of materials used to produce the cold blue vat. They uniformly direct the dyer to use two pounds of copperas, and two and a half pounds of quicklime, to two pounds of indigo. As these proportions are intended for the finest quality of Bengal indigo, and as our dyers, for want of sufficient practice, often sustain great injury by following such instructions too faithfully, I have thought it might subserve their interest to explain more fully than has hitherto been done, the operations going on during the process, by which they will be convinced of the necessity of varying the proportions, according to the quality of the indigo and other ingredients employed.

In order to enable our dyers to understand the subject, it will be necessary to explain the component parts of the indigo and copperas used in the process, and how the latter decomposes the indigo, as also to show the changes produced by the quicklime.

The best Bengal indigo is composed of about fifty-two per cent. of vegetable extract, combined with more or less of earthy matter, and of forty-eight per cent. of colouring matter, made blue by combining with oxygen. The colouring matter of indigo combines with various portions of oxygen: hence the diversity of colour, as copper, violet, purple, and blue.

Copperas is a compound substance, containing iron in a state of black oxyde, oil of vitriol in which the iron is dissolved, and water which is necessary to enable it to crystallize. In the best copperas, the proportions are about twenty-six acid, twenty-eight oxyde of iron, and forty-six water of crystallization. So long as the oxyde of iron remains in a crystalline state, it will not absorb more oxygen; but the instant it becomes separated from the acid and water, it greedily absorbs oxygen until it arrives at its maximum of oxydizement, by which time it will have combined with one-half more oxygen, and have changed from black to a red oxyde.

Indigo, when fully oxydized, can never be employed as a colouring matter, as all goods stained with it will immediately wash white; but when as much oxygen has been extracted from it as will reduce it to a green colour, which is its minimum state of oxydizement, it will colour any goods immersed in it of a beautiful green: and by reabsorbing oxygen, when exposed to the atmosphere, becomes a permanent blue in the pores of the goods.

The use of the lime is to combine with the oil of vitriol of the copperas, for the purpose of liberating its oxyde of iron. The oxyde of iron, liberated from its solvent, having a greater affinity for oxygen than the indigo has, will take it from the indigo, and reduce its colour from the blue to the green state, by which it is enabled to impart a permanent colour.

We have now the rationale of the process pursued in the cold blue vat, and I hope our dyers may understand it, to enable them to comprehend the correctness of the following deductions, in which their interest is materially involved.

The quantity of lime prescribed is always in a given proportion to the copperas employed; but as copperas varies materially in its proportions, it will be necessary to have a critical knowledge of the article—for those who have not, must be often mistaken in the result. Copperas, when newly made, must contain more water than when old enough to have become dry in the crystals—of course any given weight of new will not produce the same effect as the dry. Oxyde of iron is capable of combining with different portions of oil of vitriol, the varieties being known to the scientific, by its colour and the form of its crystals. It must be evident that as copperas, containing more than the usual portion of vitriol, must contain a smaller portion of the oxyde of iron, and requires a much larger portion of lime to liberate it, that the dyer who, for want of science or experience, shall use such an article with the usual portion of other materials, must be disappointed in his expected results.

Indigo is a very variable article, containing from five to forty-eight per cent. of colouring matter. It is certain, therefore, that when a dyer uses the same quantity of lime and copperas indiscriminately, that he must always use the same quality of indigo, or suffer great loss by some of the operations. It is all important to the blue dyer that he should be able to ascertain the relative strength of the indigo he uses, and proportion the other ingredients to it. I find very many of our blue dyers are much better acquainted with the process than they were four years since. At that time it was very common with nearly all of them to require the best indigo, and they appeared to be incapable of using a consumable quality; but now the same dyers are successful in the use of lower qualities. In England, except for some particular colours, the dyers use indigo containing from thirty to forty-five per cent. of colouring matter, and find it their interest in so doing, there being a much greater difference in the price than in the quality. When the best indigo, containing forty-eight per cent. of colouring matter, sells for two dollars, that which contains three per cent. less can be bought for one dollar sixty-six cents; that which contains six per cent. less, at one forty; and nine per cent. less, at one twenty-five. The difference in the price being so much greater than the difference in the quality, will always enable the experienced dyer, who can appreciate the quality of his indigo, and vary the process according to the quality, to drive the more ignorant ones out of the business. Those who are well acquainted with the blue dying, as carried on in England, must have observed that some few blue dyers have monopolized the best part of the business, and have become rich, under circumstances less favourable, judgment excepted, than others who have sunk under the competition.

To succeed to the best advantage in this valuable art, it is necessary our dyers should know the quality of the indigo they use, should have a critical knowledge of the copperas employed, and should be able to ascertain the strength of the lime used to decompose the copperas. They should also know what quantity of copperas the different qualities of indigo require, and the portions of lime requisite to decompose the various qualities of copperas.

It will be perceived that dying is altogether a chymical art, depending on a play of affinities varying at every step. I am aware that mere science will never make a dyer; but where science is added to experience, the artist possessing it, with usual application, cannot fail of gaining a decided advantage over his more ignorant competitor. Let me again urge our dyers to acquire as much chymical knowledge as will enable them to understand what they are doing. Without it, they will ever remain the servile imitators of European artists, following in the rear of improvement, and instead of taking the lead in their own market, must rest contented with supplying the fagend of consumption!

On mellowing cloth, after fulling, before raising the nap.

It is not generally known, that cloth cannot be raised with so good a nap, if put to the gig-mill immediately after fulling. The cloth, after fulling, should be folded and rolled up close, and let lie horizontally in that state for five or six days. It should then be taken to the gig-mill and raised. Such cloth will have a much fuller nap, and will handle much mellower, than when raised immediately from the fulling.

To dissolve shellac in water, used in France as a varnish, by paper stainers.

Dissolve twenty grains of borax in half a pint of rain-water, then add one hundred grains of powdered shellac to the liquor, which the borax will enable the water to dissolve. It should be done at a slow boil. This varnish will make paper water-proof without injuring its flexibility. It may be mixed with any colouring matter, usually used on paper, not injuring the most delicate colour.

On orchille and cudbear.

The orchille and cudbear are both made from species of the lichen. The orchille moss is found in tropical climates, such as the Canary and Cape de Verd Islands, and the moss producing cudbear is found in northern climates, as in the north of Scotland, Norway, &c.

The latitudes in which the orchille moss grows, almost exclude all expectation of ever finding it, at least of good quality, in the United States; but it is very probable the cudbear mosses may be found in some of our north-eastern States, and I would recommend, that trials be made by our citizens, living on the eastern shores of the Atlantic, of the mosses found on the rocks there, to ascertain if any of them will give out a purple colour. To enable them to do this, I will first give the scientific names of the different mosses from which cudbear is made, and then describe the process by means of which the colour can be extracted. I would advise that when any particular moss is experimented on, a part of the same be laid aside, and if the other portion is found to afford a purple, then to inquire of some botanist the technical name of that lichen.

There are four kinds of lichen (moss) from which cudbear is usually made, and the quality produced varies very materially in each. They are, the lichen pustulatus, the lichen tartarius, the lichen duestus, and the lichen vellans. The first is the most valuable, and the others are of less and less value in the order in which they are named.

To extract the colour, it will be only necessary to fill a bottle loosely with the moss, and then pour in as much spirits of ammonia as will cover it. If there be any purple colouring matter in the moss, it will show itself after macerating in the water of ammonia for four or five days, in which time the liquor will be of a rich purple.

A new patent for fulling woollen goods.

A patent has lately been secured by a mechanic living at Trowbridge, Wiltshire, England, for an entirely new machine for fulling, being a substitute for the very antique machine called fallers. I have just now seen a rough draught of the machine.

The cloth passes through two pair of rollers, and soap is used after the same manner as when felted in the fallers. It is also folded in the same doubles. The woollens work inside of a box, which is close in all parts whilst the cloth is at work. The Messrs. Cooper, owners of a large mill at Staverton, near Trowbridge, having tried one of these machines, have subsequently thrown out all their fallers, and substituted the rollers in place of them. From their account, the rollers not only prevent damage, but the substance and quality of the cloth is so much improved, that it sells for fifteen per cent. more than those of the same make, felted in the usual falling mill.

Another process for scouring wool.

This process is said to scour wool better than any before invented. I have never seen wool scoured in this way, but my informant, who uses it, says that the wool is turned out cleaner, and in much better condition, than he has ever seen it from any other mode.

In a scouring furnace, holding fifty gallons, put three buckets of stale urine, and fill up with water, bring on the heat to the usual temperature, and add one pint of coarse sea-salt. In this lixivium the wool is scoured. The first dip of wool, as is usual in other fresh made liquors, does not scour perfectly clean, but the subsequent dips will be complete. After working the first day, add one handful of the same kind of salt, and the same quantity for every day it is worked. It will require no additional urine.

THE END.

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